User Manual

Allen-Bradley

Bulletin 193 EtherNet/IP Communications Auxiliary

Catalog Number 193-DNENCAT, 193-DNENCATR

Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc., is prohibited.

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence
	SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Allen-Bradley, Rockwell Software, Rockwell Automation, and TechConnect are trademarks of Rockwell Automation, Inc.

Trademarks not belonging to Rockwell Automation are property of their respective companies.

Chapter 1

Installation & Wiring

Introduction 7
Overview 7
Features 9
Installation 9
Wiring 10
Dimensions 11
Network Design 12

Chapter 2

Configure the EtherNet/IP Communications Auxiliary

Introduction 15
Determining Network Parameters 15
Setting the IP Network Address 16
    EtherNet/IP Node Address Selection Switches 16
Assign Network Parameters via the BOOTP/DHCP Utility 17
Assign Network Parameters Via a Web Browser & MAC Scanner Software 19
    Other Factors to Consider When Assigning Network Parameters. 22
Duplicate IP Address Detection 22
    Behavior of Modules With Duplicate IP Addresses 23
DNS Addressing 23
Electronic Data Sheet (EDS) File Installation 23
    Download the EDS File 24
    Register the EDS File 25

Chapter 3

Configure the DeviceNet Network

Introduction 31
Configuration 31

Chapter 4

Add Devices to the DeviceNet Network

Introduction 35
DeviceNet Node Addressing 35
    Node Address Basics 36
Set the Node Address 36
    Using the Hardware Mechanism 36
    Using the DeviceNet Node Commissioning Tool 37
Add DeviceNet Modules to the Scan List 40
    Simple 40
    User-Defined 41

Chapter 5

View & Configure Parameters

Introduction 43
View & Edit 43

Chapter 6

Automatic Device Recovery or Replace

Introduction 47
Setting ADR 47

Chapter 7

Automation Controller Communications

Introduction 51
Ethernet Messaging 51
I/O Messaging 51
- ControlLogix Configuration with Add-On Profiles 51
- EtherNet/IP Network Configuration with Add-On Profiles 53
- Accessing Module Data with Add-On Profiles 56
- ControlLogix Generic Configuration 57
- EtherNet/IP Generic Module Configuration 58
- Accessing Generic Module Data 61

Logic Explicit Messaging 63

Chapter 8

E-mail/Text

Introduction 67
E-mail Notifications 67
- Events 67
- E-mail Contents 67
- E-mail Configuration 68
- Configure Device Identity 69
- Text Notifications 70

Limitations 71

Chapter 9

Device Parameters

Introduction 73
Parameter Programming 73
- Parameter Listing 73

Chapter 10

Troubleshooting

Introduction 79
EtherNet/IP Modules of Operation. 79
Power-Up Reset Mode 80
Run Mode 81
Recoverable Error Mode 82
Unrecoverable Error Mode 82
Troubleshooting Procedures 82
. 84

Appendix A

Specifications

Specifications 85

Appendix B

EtherNet/IP & DeviceNet Information

Electronic Data Sheet (EDS) Files 89
Common Industrial Protocol (CIP) Objects. 89
Identity Object — CLASS CODE 0x01. 89
Message Router Object — CLASS CODE 0x02. 90
DeviceNet Object — CLASS CODE 0x03 91
Assembly Object — CLASS CODE 0x04 91
Connection Manager Object — CLASS CODE 0x06 95
Parameter Object — CLASS CODE 0x0F. 96
Device Level Ring (DLR) Object — CLASS CODE 0x47 97
QoS Object — CLASS CODE 0x48 98
Non-Volatile Storage Object — CLASS CODE 0xA1. 98
Port Object — CLASS CODE 0x0F4. 99
TCP/IP Interface Object — CLASS CODE 0xF5 100
Ethernet Link Object — CLASS CODE 0xF6. 101

Installation & Wiring

Introduction

The purpose of this chapter is to provide the necessary instructions to successfully install the Bulletin 193 Ethernet™/IP Communications Auxiliary and properly connect it to an EtherNet/IP and DeviceNet™ network.

Overview

The Bulletin 193 EtherNet/IP Communications Auxiliary is an EtherNet/IP to DeviceNet linking device. It provides a means for devices that primarily communicate on a DeviceNet network (e.g., a Bulletin 193 or 592 E3 Plus Overload Relay or a Bulletin 825-P Electronic Overload Relay) to communicate to EtherNet/IP-based scanners. The EtherNet/IP Communications Auxiliary allows up to six (6) DeviceNet-based devices to be scanned via Implicit Messaging and can bridge explicit messaging for all nodes on a DeviceNet network. The EtherNet/IP Communications Auxiliary uses an internal web server to configure the module, the DeviceNet network, and DeviceNet-based devices that fully support the Parameter Object.

SHOCK HAZARD: To prevent electrical shock, disconnect the EtherNet/IP Communications Auxiliary from its power source **before** installing or servicing. Install in suitable enclosure. Keep free from contaminants.

ATTENTION: The EtherNet/IP Communications Auxiliary contains ESD (electrostatic discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the EtherNet/IP Commuications Auxiliary. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, refer to Rockwell Automation publication 8000-4.5.2, "*Guarding Against Electrostatic Damage*", or any other applicable ESD protection handbook.

ATTENTION: The purpose of this document is to serve as a guide for proper installation. The National Electrical Code (NEC) and any other governing regional or local code will take precedence. Rockwell Automation cannot assume responsibility for the compliance or proper installation of the EtherNet/IP Communications Auxiliary or associated equipment. A hazard of personal injury and/or equipment damage exists if codes are ignored during installation.

ATTENTION: An incorrectly applied or installed EtherNet/IP Communications Auxiliary can result in damage to the components or reduction in product life. Wiring or application errors (e.g., supplying incorrect or inadequate supply voltage or operating/storing in excessive ambient temperatures) may result in malfunction of the product.

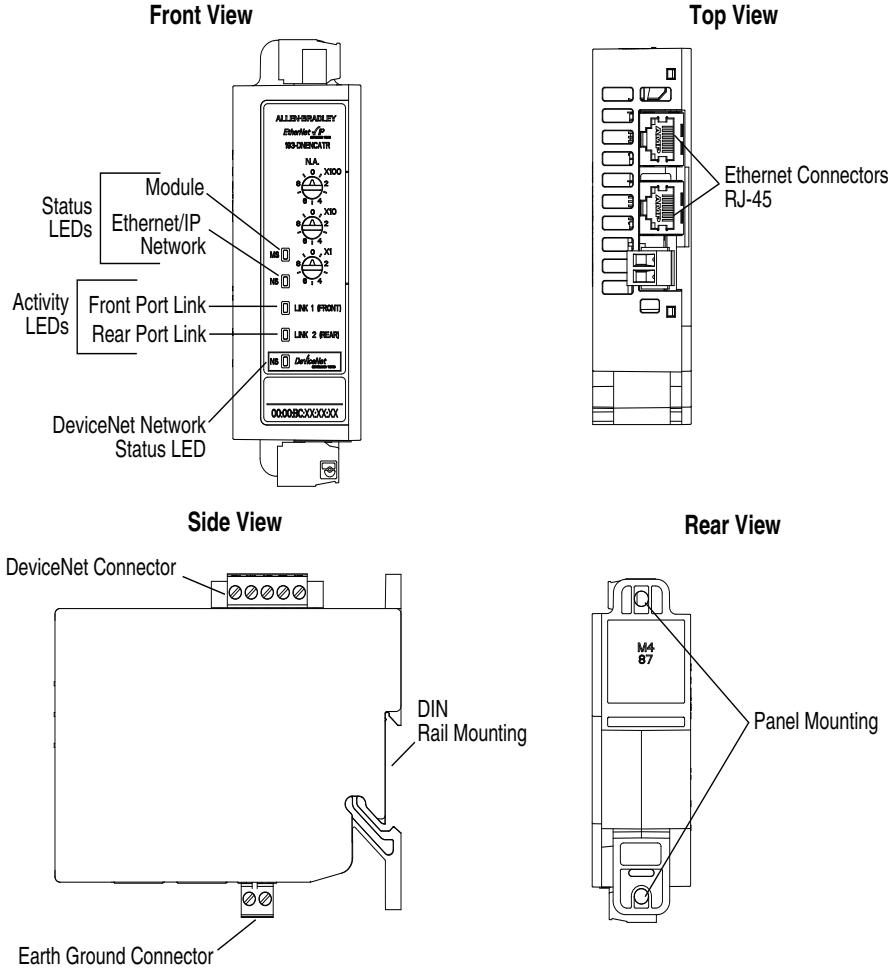
ATTENTION: Only personnel familiar with the EtherNet/IP Communications Auxiliary and associated machinery should plan to install, set up, and maintain the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

ATTENTION: To remain compliant with UL/CSA Certifications, the DeviceNet power supply **must** meet NEC Class 2 Requirements.

Features

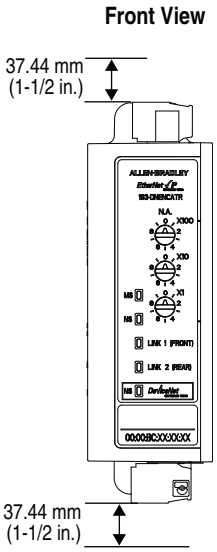
Figure 1 - Features



Installation

The EtherNet/IP Communications Auxiliary may be DIN Rail or panel mounted. To avoid overheating, the unit **must** be mounted vertically and requires 37.4 mm (1-1/2 in.) of clearance at the top and bottom to allow proper air flow. The temperature ratings for the unit will be derated if not mounted in this manner.

Figure 2 - Installation



Wiring

The EtherNet/IP Communications Auxiliary can accept all forms of DeviceNet cable. However, DeviceNet shielded cable is recommended. The EtherNet/IP Communications Auxiliary complies with the Open Device Vendors Association (ODVA) DeviceNet compliance testing when the distance between end nodes is 100 m or less with 60 or fewer network drops.

Table 1 - Wire & Torque Specifications

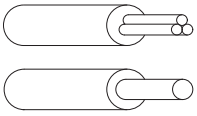
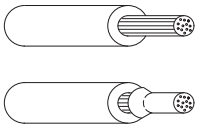
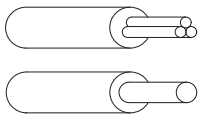
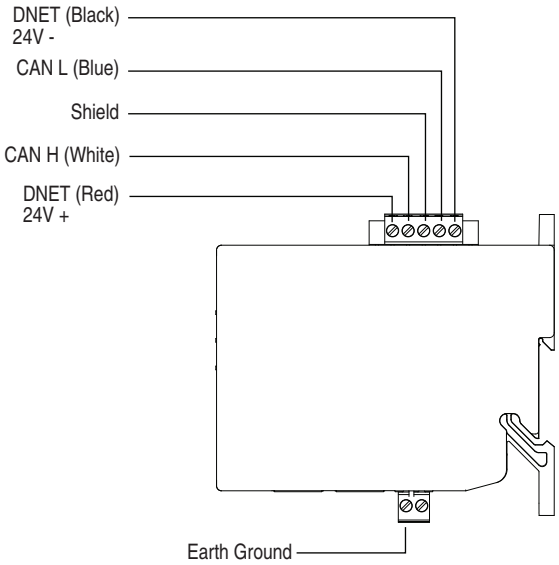
Wire		Torque
	1X 2X	24…12 AWG 24…16 AWG 5 lb.•in.
	1X 2X	0.2…2.5 mm^2 0.25…1 mm^2 0.56 N•m
	1X 2X	0.2…2.5 mm^2 0.2…1 mm^2 0.56 N•m

Figure 3 - Wiring Diagram

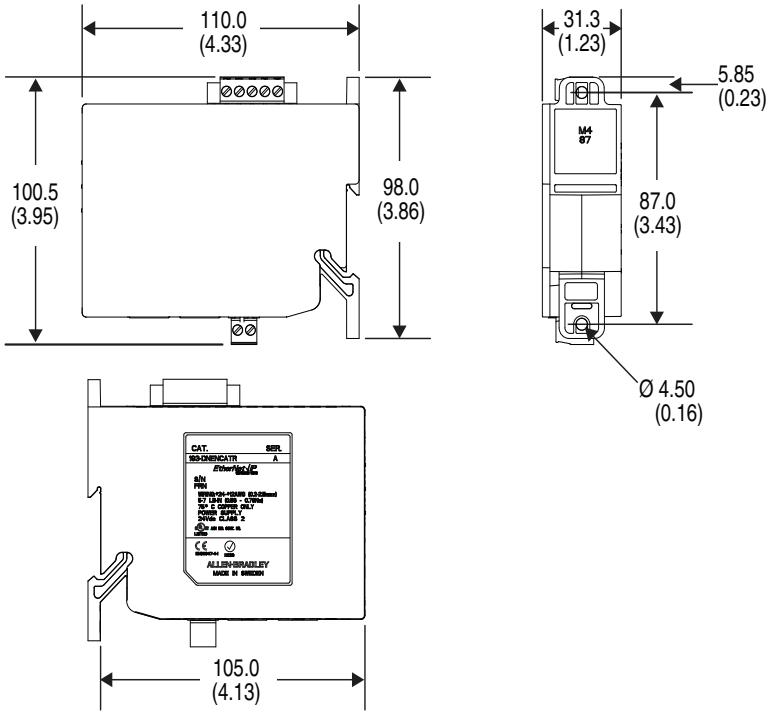


ATTENTION: Use a shielded DeviceNet cable to comply with CISPR 22 and CISPR 24.

Dimensions

Figure 4 - Dimension Diagram

Dimensions are shown in millimeters (inches).

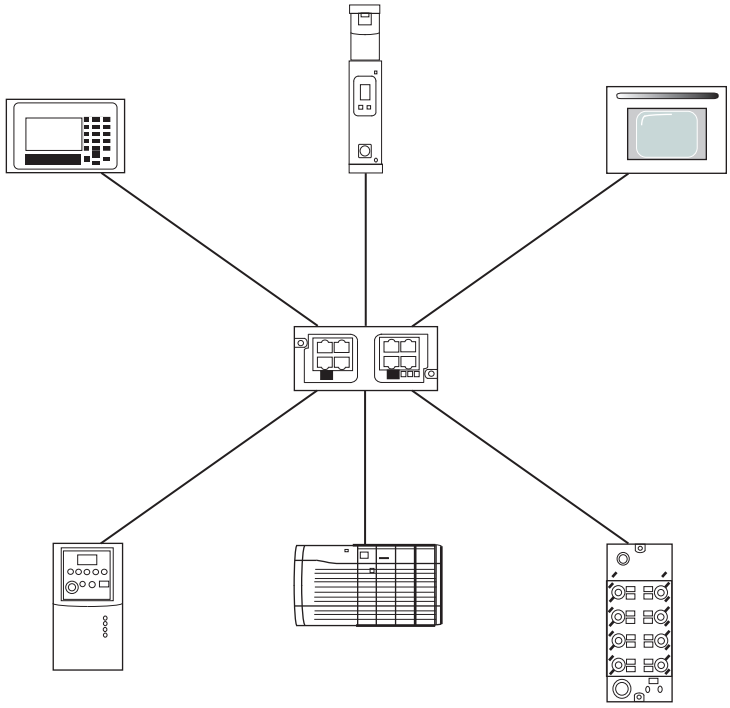


Network Design

The EtherNet/IP Communications Auxiliary is available as a single Ethernet port (Cat. No. 193-DNENCAT) and dual Ethernet port (Cat. No. 193-DNENCATR) module that has RJ-45 ports to connect to Ethernet cable CAT5 type or better . Rockwell Automation offers a wide variety of Allen-Bradley Ethernet patch cables with its Bulletin 1585 line of Ethernet cables (http://ab.rockwellautomation.com/Connection-Devices/RJ45-Network-Media).

Both the 193-DNENCAT and 193-DNENCATR devices support a Star Ethernet topology in which all Ethernet nodes wire back to a central Ethernet switch, hub, or router as shown in Figure 5 on page 12.

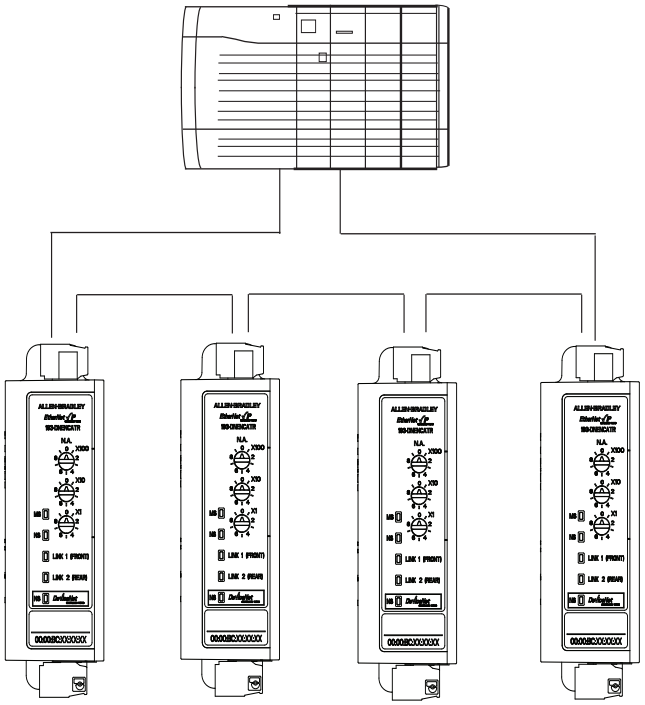
Figure 5 - Star Ethernet Topology



Rockwell Automation also offers a line of managed and unmanaged Allen-Bradley Ethernet Switches with its Stratix™ family of Ethernet switches. Refer to http://ab.rockwellautomation.com/Networks-and-Communications/Ethernet-IP-Infrastructure for more information.

The Cat. No. 193-DNENCATR Module also supports a Ring Ethernet topology in which all Ethernet nodes are wired in series with one another until a complete network ring is made as shown in Figure 6 on page 13.

Figure 6 - Ring Ethernet Topology



The Cat. No. 193-DNENCATR Module supports Rockwell Automation's Device Level Ring (DLR) topology as a slave device in which the EtherNet/IP network will still continue to communicate in the event that one of the network chains is disrupted.

Configure the EtherNet/IP Communications Auxiliary

Introduction

This chapter describes how to configure an EtherNet/IP Communications Auxiliary to operate on an EtherNet/IP network.

When you first install an EtherNet/IP Communications Auxiliary, the module is Dynamic Host Configuration Protocol (DHCP) enabled.

Determining Network Parameters

To operate an EtherNet/IP network, you must define these parameters.

Table 2 - EtherNet/IP Network Parameters

Network Parameter	Description
IP Address	The IP address uniquely identifies the module. The IP address is in the form xxx.xxx.xxx.xxx where each xxx is a number from 0...255. Do not use the following IP addresses, as these are reserved values: • 0.0.0.1...0.255.255.255 • 127.0.0.0...127.255.255.255 • 224.255.255.255...255.255.255.255
Subnet Mask	Subnet addressing is an extension of the IP address scheme that allows a site to use a single network ID for multiple physical networks. Routing outside of the site continues by dividing the IP address into a net ID and a host ID via the class. Inside a site, the subnet mask is used to redivide the IP address into a custom network ID portion and host ID portion. **NOTE:** If you change the subnet mask of an already-configured module, you **must** cycle power to the module for the change to take effect.
Gateway	A gateway connects individual physical networks into a system of networks. When a node needs to communicate with a node on another network, a gateway transfers the data between the two networks.

If DNS addressing is used or if the module is referenced via a host name in an MSG instruction, the following parameters must be defined.

NOTE: Consult with your Ethernet network administrator to determine if these parameters need to be specified.

Table 3 - EtherNet/IP Network Parameters for DNS Addressing

Network Parameter	Description
Host Name	A host name is part of a text address that identifies the module. The full text address of a module is: *host_name.domain_name*.
Domain Name	A domain name is part of a text address that identifies the domain in which the module resides. The full text address of a module is: *host_name.domain_name*. The domain name has a 48-character limit.
Primary DNS Server Address	This identifies any DNS servers used in the network. You must have a DNS server configured if you specify an SMTP server with a name. The DNS server converts the domain name or host name to an IP address that can be used by the network. For more information on DNS addressing, refer to page 23.
Secondary DNS Server Address	

Setting the IP Network Address

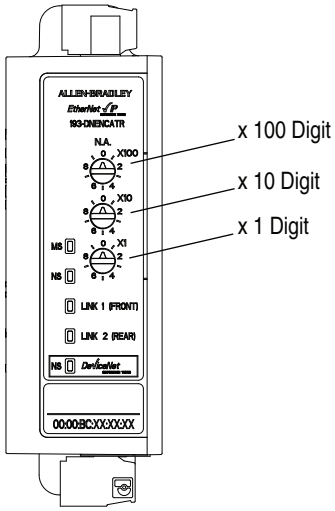
An EtherNet/IP Communications Auxiliary ships with DHCP enabled. You can set the network Internet Protocol (IP) address by using:

- the EtherNet/IP node address selection switches,
- a Bootstrap Protocol (BOOTP)/Dynamic Host Configuration Protocol (DHCP) server (e.g., the Rockwell Automation BOOTP-DHCP Server Utility, which is included with Rockwell Software's RSLinx™ Classic software), **OR**
- a web browser and MAC scanner software.

EtherNet/IP Node Address Selection Switches

The EtherNet/IP Communications Auxiliary comes with three node address selection switches that allow the user to select the last octet for the IP address 192.168.1.xxx.

Figure 7 - Last Octet Selection



EXAMPLE When the top dial is set to **1**, the middle dial is set to **2**, and the bottom dial is set to **3**, the resulting IP address is: 192.168.1.**123**.

When the node address selection switches are set to a value greater than 255, the IP address is set to DHCP Enabled or programmed for a static IP address.

Assign Network Parameters via the BOOTP/DHCP Utility

By default, the EtherNet/IP Communications Auxiliary is DHCP Enabled. The BOOTP/DHCP utility is a standalone program that is located in the BOOTP-DHCP Server folder accessed from the Start menu.

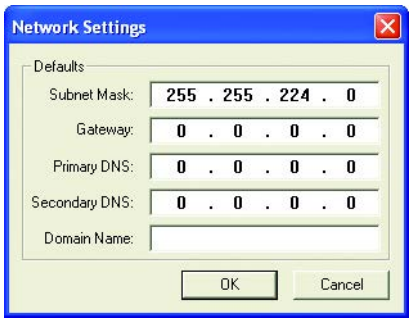
IMPORTANT **Before starting the BOOTP/DHCP utility**: Make sure you have the hardware MAC ID of the module, which is printed on the front of the EtherNet/IP Communications Auxiliary. The MAC ID has a format similar to: 00-0b-db-14-55-35.

This utility recognizes DHCP-enabled devices and provides an interface to configure a static IP address for each device.

To assign network parameters via the BOOTP/DHCP utility, perform this procedure:

1. Execute the BOOTP/DHCP software.
2. Choose Tool >Network Settings.

3. If appropriate for the network, type the subnet mask, gateway address, primary/secondary server addresses, and domain name in their respective fields.

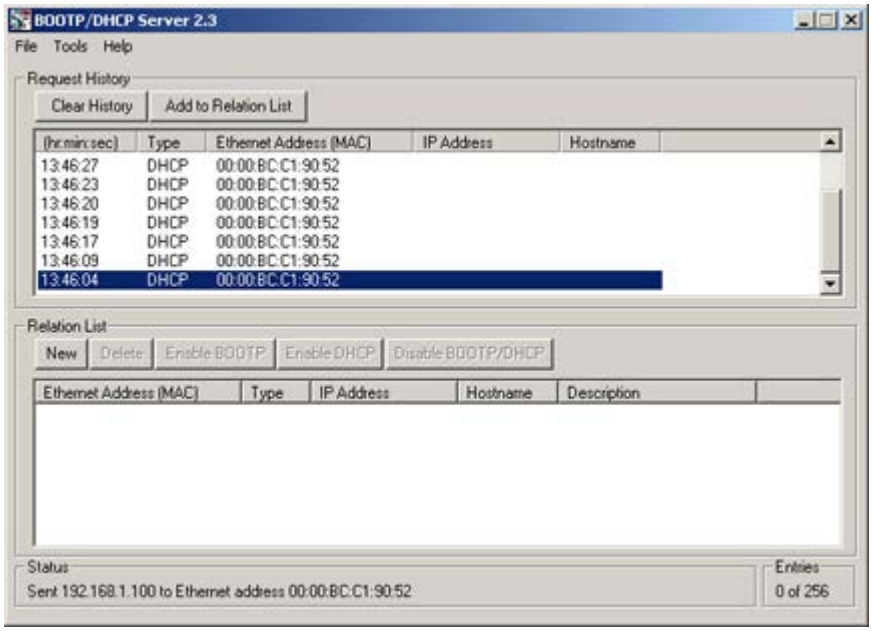


4. Click OK.

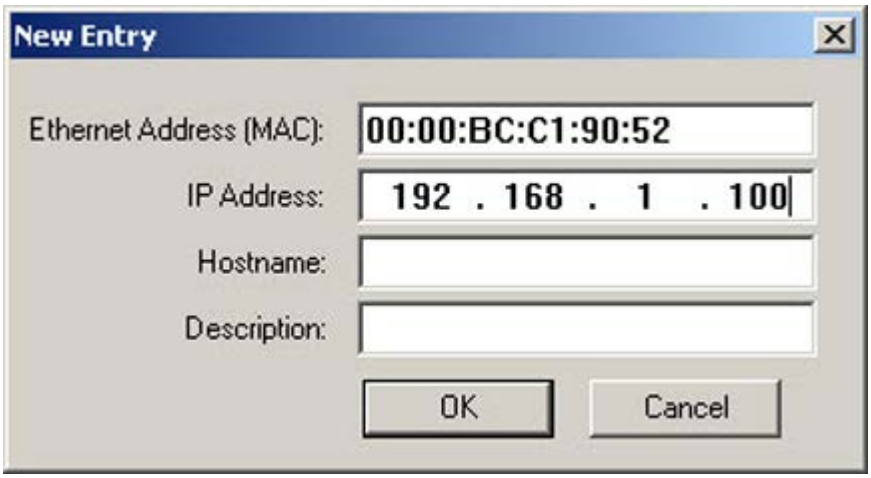
   The Request History panel displays the hardware addresses of modules issuing BOOTP or DHCP requests.

5. Double-click the MAC address of the module to be configured.

NOTE: The MAC address is printed on the front of the EtherNet/IP Communications Auxiliary. The format of the hardware address resembles:
00-0b-db-14-55-35



The New Entry window appears with the module's Ethernet Address (MAC).



6. Type the IP address, host name, and a module description.
7. Click OK.
8. Cycle power to the module by removing and reapplying the DeviceNet connector.
9. To permanently assign this configuration to the module: Select the module in the Relation List panel and click Disable BOOTP/DHCP.

   When module power is cycled, it uses the assigned configuration and does not issue a DHCP request.

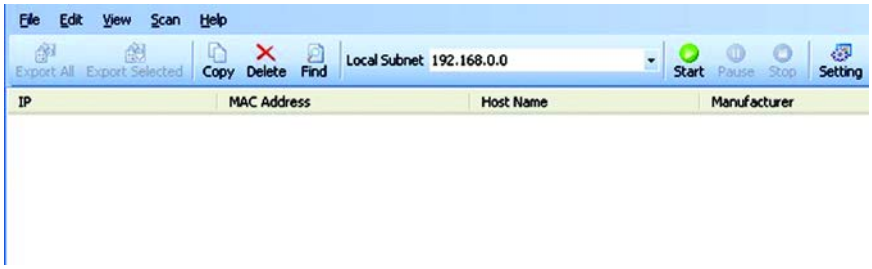
   If you do not click Disable BOOTP/DHCP, on a power cycle, the module clears the current IP configuration and will again begin sending DHCP requests.

Assign Network Parameters Via a Web Browser & MAC Scanner Software

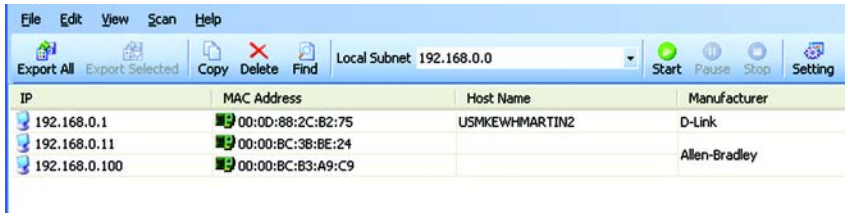
In the event that a user does not have access to a DHCP software utility, a user can assign network parameters via a web browser (e.g., Microsoft® Internet Explorer) and Media Access Control (MAC) scanner software (e.g., MAC Scanner from Colasoft® - http://www.colasoft.com/). Follow these steps to configure the module using this method.

1. Locate and identify the MAC ID printed on the label of the EtherNet/IP Communications Auxiliary. This address has a format that is similar to: 00-0b-db-14-55-35
2. Connect the EtherNet/IP Communications Auxiliary to the same wide area network (WAN) as your personal computer.
3. Initiate the MAC scanner software.

4. Select the appropriate subnet to scan for available MAC addresses.

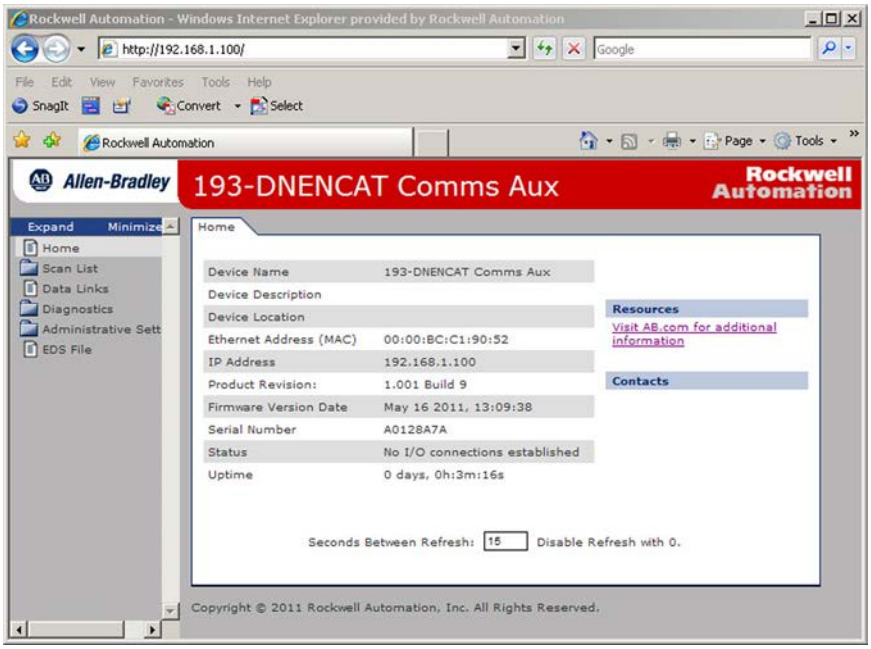


5. Scan the Subnet for all available MAC addresses.



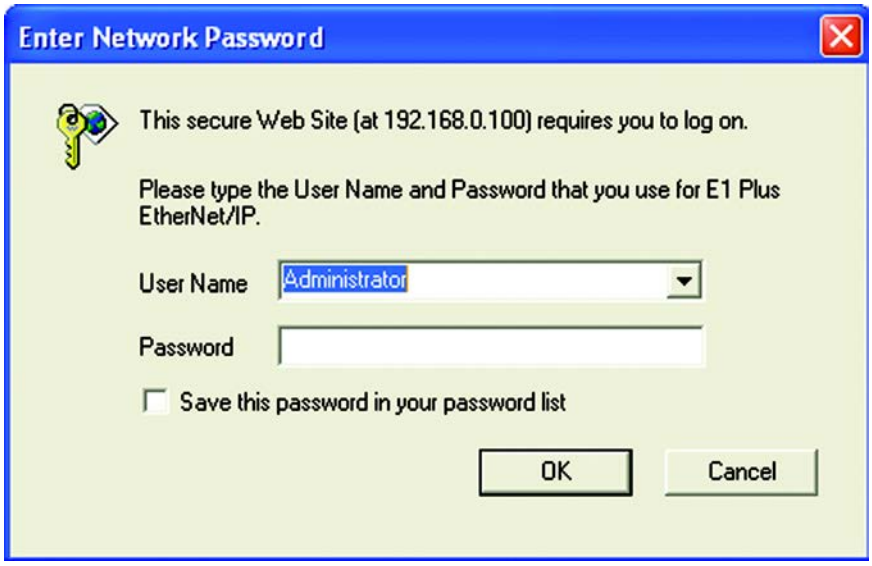
6. Identify the IP address assigned to the MAC ID of the EtherNet/IP Communications Auxiliary. The IP address will have a format that is similar to 192.168.0.100.

7. Open a web browser and type the IP address on the address line to view the internal web server of the EtherNet/IP Communications Auxiliary.

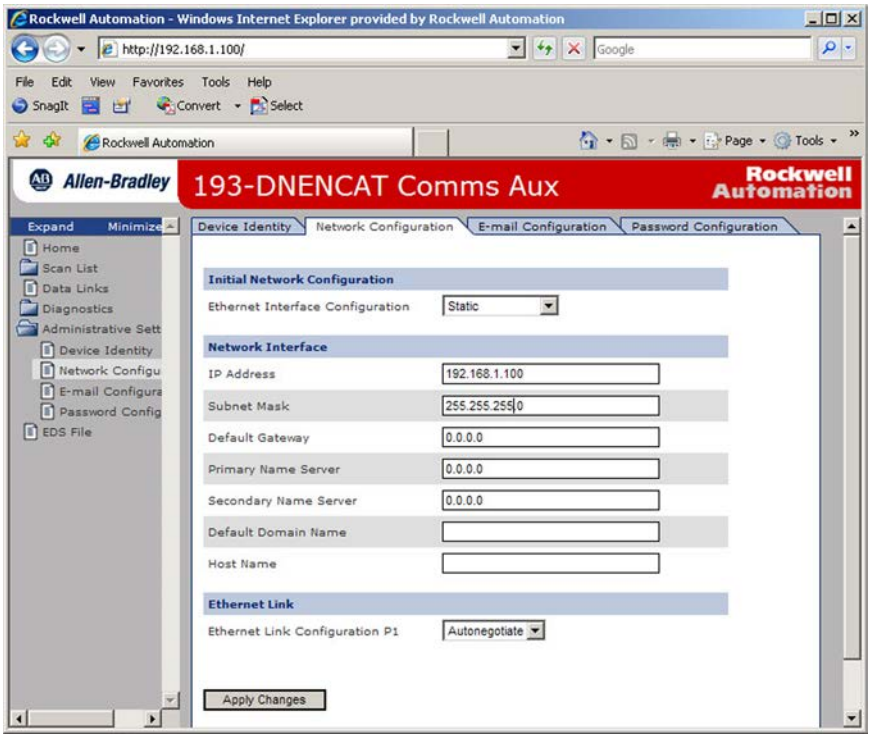


8. Select Administration Settings>Network Configuration to change the IP address of the EtherNet/IP Communications Auxiliary to a static IP address.

9. The module will prompt the user for a User Name and Password. Type "Administrator" as the user name, leave the password field blank, then click OK.


Enter Network Password
This secure Web Site (at 192.168.0.100) requires you to log on.
Please type the User Name and Password that you use for E1 Plus EtherNet/IP.
User Name
Administrator
Password
Save this password in your password list
OK
Cancel

10. Assign the appropriate network settings per the recommendation of the network administrator for the network that this module will be communicating on and click Apply.



11. Remove and reapply the DeviceNet connector to allow the communications changes to take affect.

Other Factors to Consider When Assigning Network Parameters

There are other factors to consider when assigning networks parameters, which include the:

- network isolation from or integration into the plant/enterprise network.
- network size.
  For large networks, even isolated networks, it might be more convenient and safer to use a BOOTP/DHCP server rather than RSLinx software. The BOOTP/DHCP server also limits the possibility of assigning duplicate IP addresses.
- company policies and procedures associated with plant floor network installation and maintenance.
- level of involvement by information technology personnel in plant floor network installation and maintenance.
- type of training offered to control engineers and maintenance personnel.

If the Rockwell Automation BOOTP or DHCP server is used in an uplinked subnet where an enterprise DHCP server exists, a module may get an address from the enterprise server before the Rockwell Automation utility even sees the module. In this case, disconnect the uplink to set the address and configure the module to retain its static address **before** reconnecting to the uplink. This is not a problem if you have node names configured in the module and leave DHCP enabled.

ATTENTION: The EtherNet/IP Communications Auxiliary must be assigned a fixed network address. The IP address of this module **must not** be dynamically provided. Failure to observe this precaution may result in unintended machine motion or loss of process control.

Duplicate IP Address Detection

When you change the IP address or connect the module to an EtherNet/IP network, the module checks to make sure that the IP address assigned to this module does not match the address of any other network device. If the module determines that another device on the network with a matching IP address, the EtherNet/IP port of the module goes into conflict mode where the Network Status LED indicator is solid red.

To resolve this conflict, use the instructions below to change the IP address of the module. Then, cycle power to the module or reset the modules by disconnecting and then reconnecting the Ethernet cable.

Two modules could possibly detect a conflict simultaneously. If this occurs, perform this procedure.

1. Remove the module with the incorrect IP address and correct its conflict.
2. Cycle power or disconnect the Ethernet cable from the second module and reconnect it.

Behavior of Modules With Duplicate IP Addresses

Devices in conflict over an IP address behave differently depending on whether connections have been established to either of the modules and whether both modules support duplicate IP address detection.

Table 4 - Device Conflict over Duplicate IP Addresses

If	then
both modules support duplicate IP address detection,	the first started module uses and retains its IP address. The other module will detect a conflict, give up the IP address and enter conflict mode.
both modules support duplicate IP address detection and are started at roughly the same time,	one of the modules surrenders the IP address and enters conflict mode.
one module supports duplicate IP address detection and a second module does not,	the second module generally keeps its IP address, regardless of which module first obtains the IP address. The module that supports duplicate IP address detection will detect the conflict and give up the IP address.

DNS Addressing

To further qualify a module's address, use DNS addressing to specify a host name for a module, which also includes specifying a domain name and DNS servers. DNS addressing makes it possible to set up similar network structures and IP address sequences under different domains.

DNS addressing is only necessary if you refer to the module by host name, such as in path descriptions in MSG instructions.

To use DNS addressing, perform this procedure.

1. Assign a host name to the module.

   NOTE: Contact the network administrator ro have a host name assigned. Valid host names should be IEC-1131-3 compliant.

2. Configure the module's parameters.
3. In addition to the IP address, subnet mask, and gateway address, configure a host name for the module, domain name, and primary/secondary DNS server addresses.

Electronic Data Sheet (EDS) File Installation

Before the EtherNet/IP Communications Auxiliary is configured to communicate on an EtherNet/IP network, it must be registered to the software that configures the network (e.g., Rockwell Automation RSLinx Classic and RSNetWorx for EtherNet/IP software). A user registers the module by installing an EDS file. The EDS file for the EtherNet/IP Communications Auxiliary can be obtained from one of two locations:

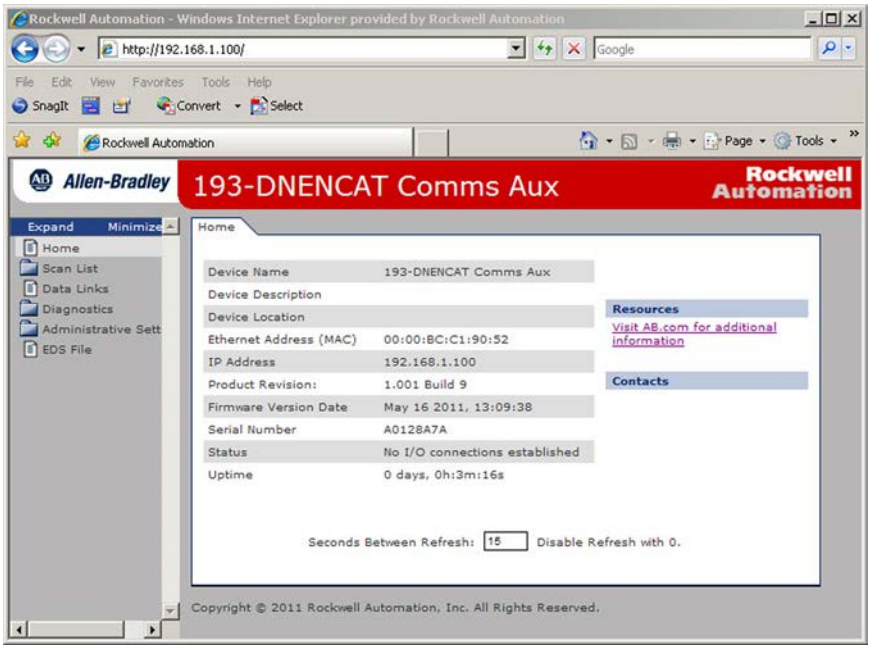
- embedded in the module **OR**
- the Allen-Bradley EDS file download website.

Download the EDS File

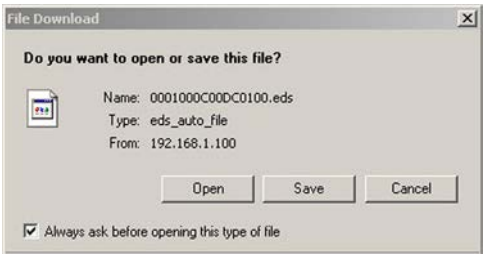
Embedded in the Module

The EDS file for the EtherNet/IP Communications Auxiliary is embedded within the module. After the IP address for the module has been configured, connect the module to same Ethernet network as a personal computer. Using a web browser on the personal computer, a user can download the EDS file using a web browser by following these steps:

1. Type the IP address of the EtherNet/IP Communications Auxiliary on the address line of the web browser.



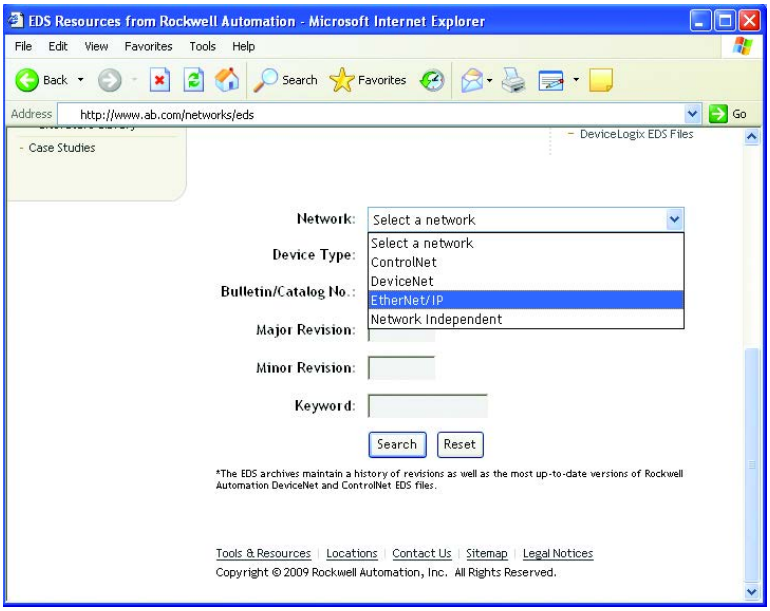
2. Select EDS File link
3. Click Save to save the EDS file to the personal computer.



From the EDS File Download Site

The EDS file for the EtherNet/IP Communications Auxiliary can also be downloaded from the Allen-Bradley EDS File download site. Using a web browser on the personal computer that is connected to the internet, a user can download the EDS file by following these steps:

1. Type http://www.ab.com/networks/eds on the address line of the web browser.
2. Select EtherNet/IP as the network type, then click Search.

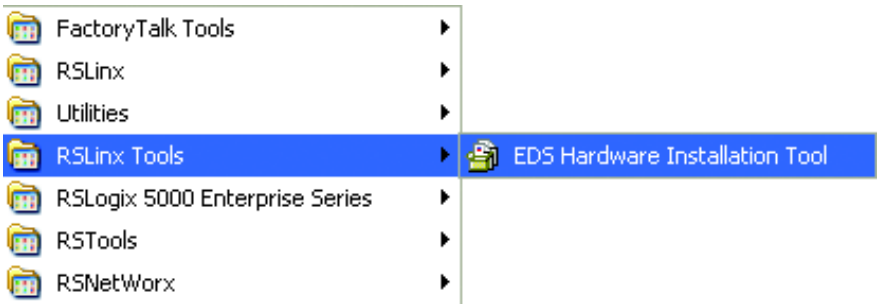


3. Locate the EDS file for the EtherNet/IP Communications Auxiliary and download it to the personal computer.

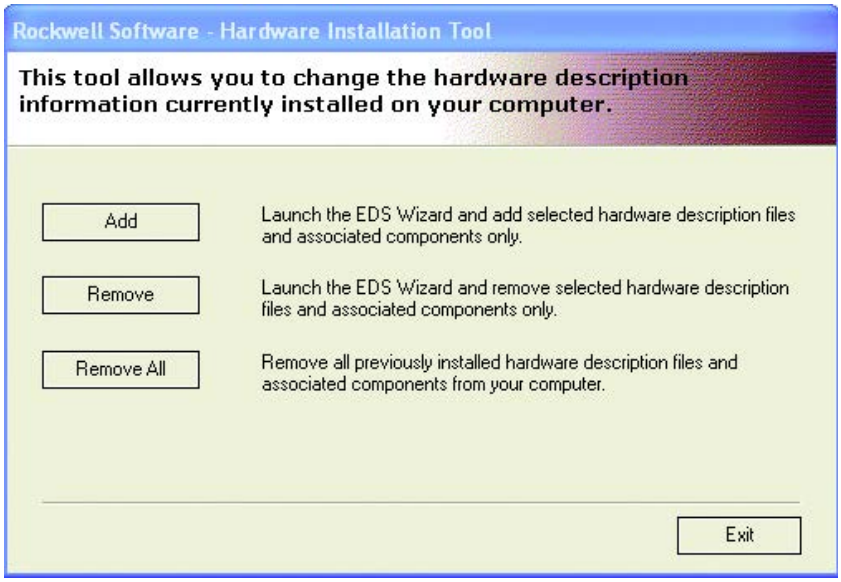
Register the EDS File

After the EDS file has been downloaded, a user will need to register the EDS file with the software that configures the EtherNet/IP network. The following example lists the steps needed to register an EDS file with Rockwell Automation's RSLinx Classic software.

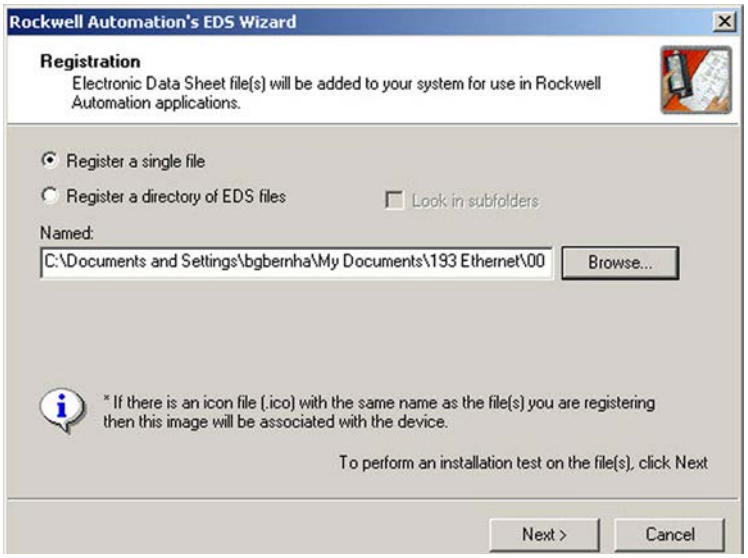
1. Start the EDS Hardware Installation Tool located at Start>Programs> Rockwell Software>RSLinx Tools.



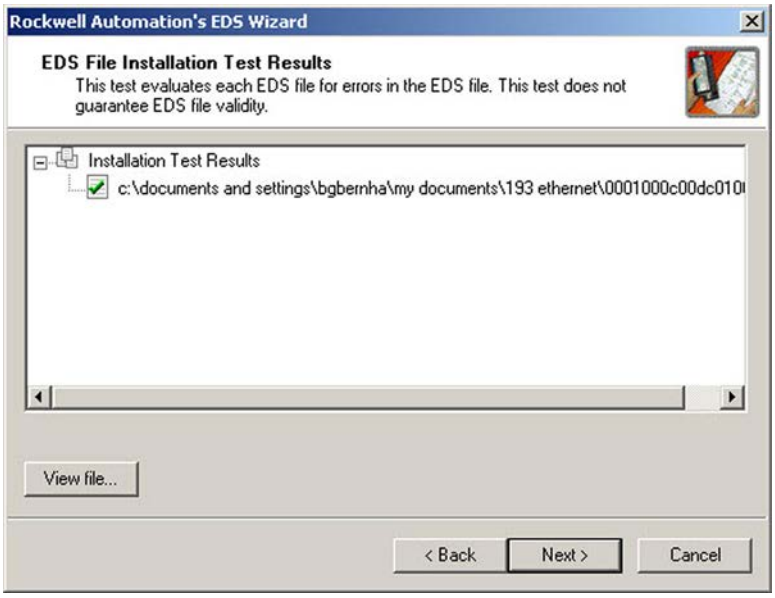
2. Click Add to register a new device.


Rockwell Software - Hardware Installation Tool
This tool allows you to change the hardware description information currently installed on your computer.
Add
Launch the EDS Wizard and add selected hardware description files and associated components only.
Remove
Launch the EDS Wizard and remove selected hardware description files and associated components only.
Remove All
Remove all previously installed hardware description files and associated components from your computer.
Exit

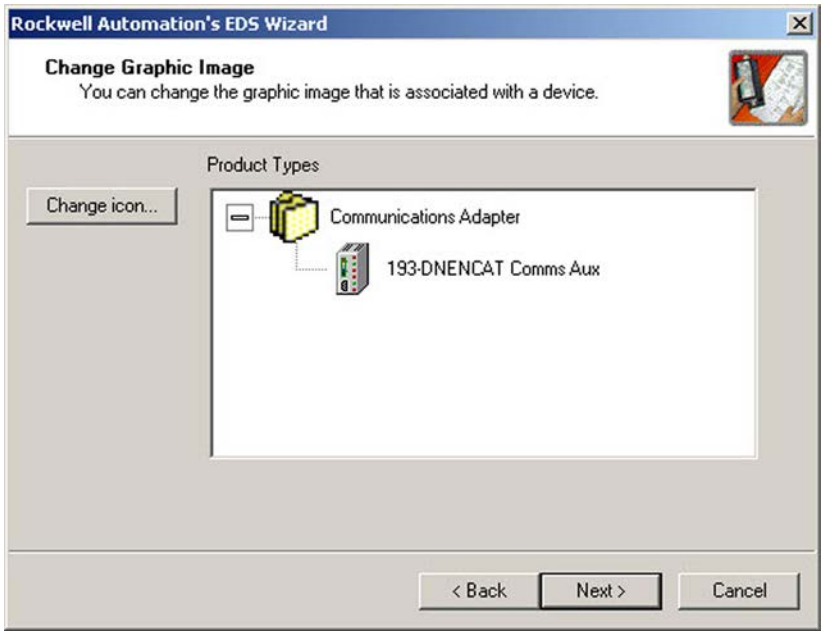
3. Click the "Register a single file" radio button, then browse to the location where the EDS file is located. Click Next.


Rockwell Automation's EDS Wizard
Registration
Electronic Data Sheet file(s) will be added to your system for use in Rockwell Automation applications.
Register a single file
Register a directory of EDS files
Look in subfolders
Named:
C:\Documents and Settings\bgbernha\My Documents\193 Ethernet\00
Browse...
* If there is an icon file (.ico) with the same name as the file(s) you are registering then this image will be associated with the device.
To perform an installation test on the file(s), click Next
Next >
Cancel

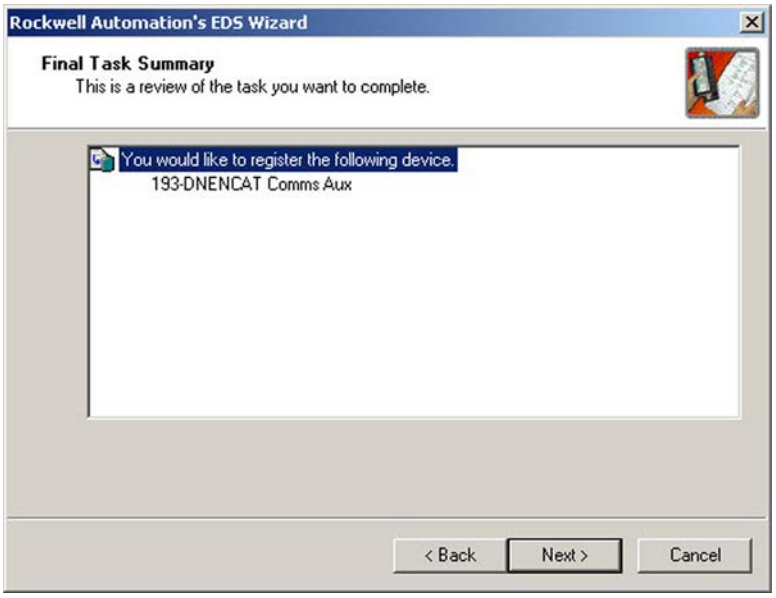
4. Click Next to accept the installation test results.


Rockwell Automation's EDS Wizard
EDS File Installation Test Results
This test evaluates each EDS file for errors in the EDS file. This test does not guarantee EDS file validity.
Installation Test Results
c:\documents and settings\bgbernha\my documents\193 ethernet\0001000c00dc010
View file...
< Back
Next >
Cancel

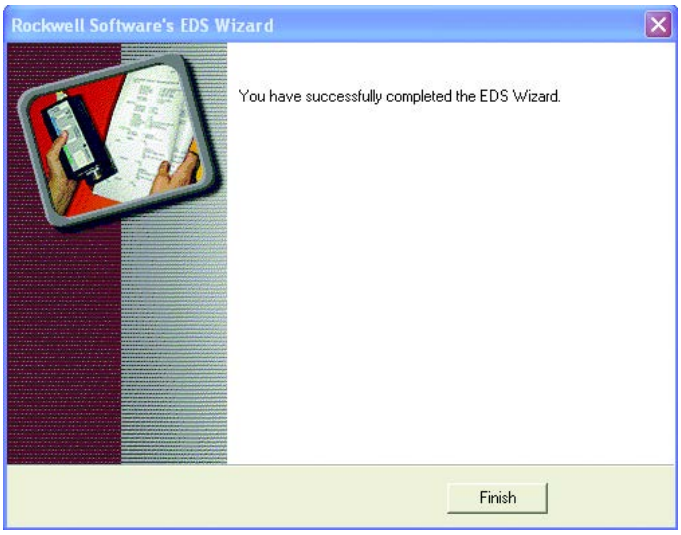
5. Click Next to accept the graphic image.



6. Click Next to register the device.


Rockwell Automation's EDS Wizard
Final Task Summary
This is a review of the task you want to complete.
You would like to register the following device.
193-DNENCAT Comms Aux
< Back
Next >
Cancel

7. Click Finish to successfully register the module.



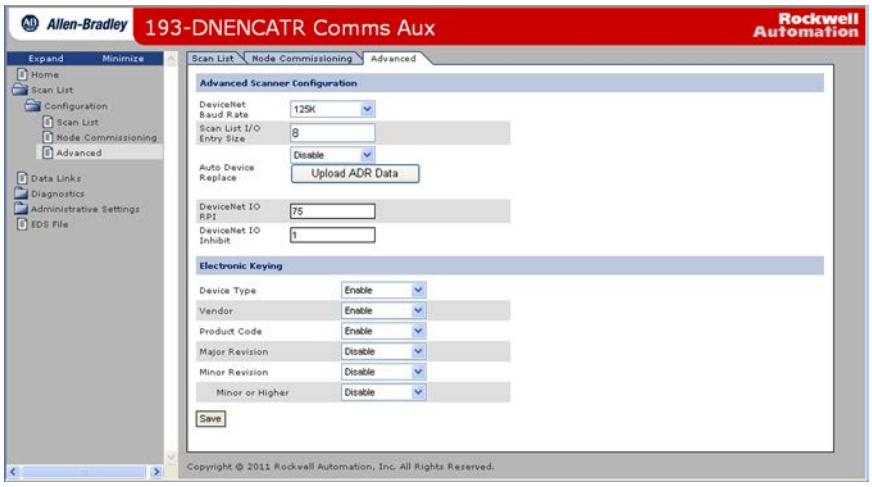
Configure the DeviceNet Network

Introduction

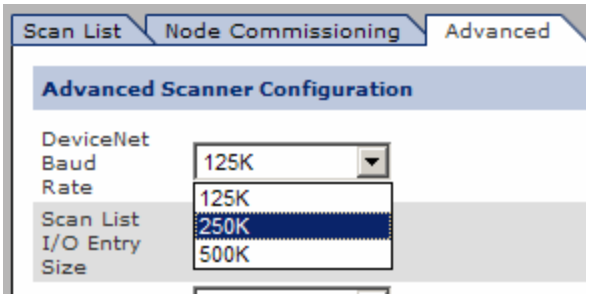
The purpose of this chapter is to assist in configuring the DeviceNet Network with the EtherNet/IP Communications Auxiliary. A DeviceNet network can be configured using the internal web interface from the EtherNet/IP Communications Auxiliary.

Configuration

1. From the web page, navigate to Scan List>Configuration>Advanced.



2. If desired, change the baud rate using the DeviceNet Baud Rate pull-down menu. The default value of 125K for the DeviceNet network.



NOTE: Autobaud is not supported with this product.

3. Type the size of the Scan List I/O Entry in the field.

   The entry size determines the number of input and output bytes that the EtherNet/IP Communications Auxiliary will scan from each of the scanned devices. The maximum Scan List I/O Entry Size supported is 50 bytes with the default value being 8 bytes.

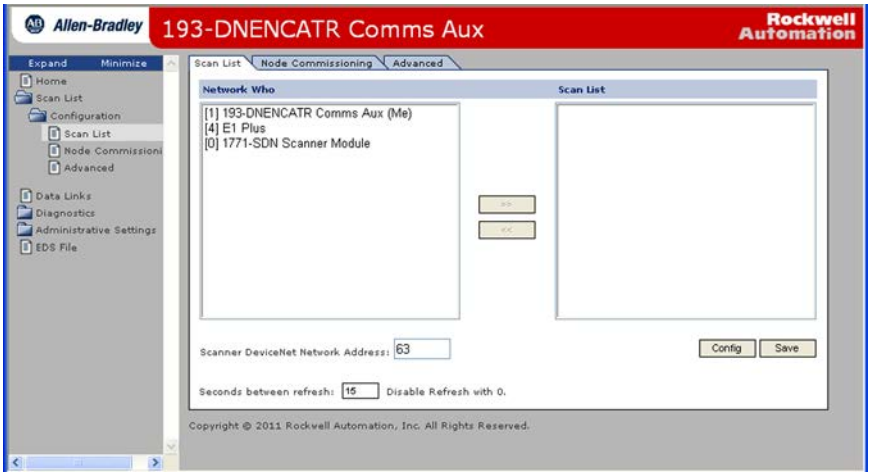
NOTE: Auto Device Replacement (ADR) is discussed in Chapter 6, Automatic Device Recovery or Replace.

4. If necessary, adjust DNet IO Request Packet Interval (RPI) and DNet IO Inhibit.

   DNet IO RPI determines the time it takes for data to be requested; DNet IO Inhibit is the time used on DeviceNet Change of State (COS) I/O. Both of these parameters are measured in milliseconds.

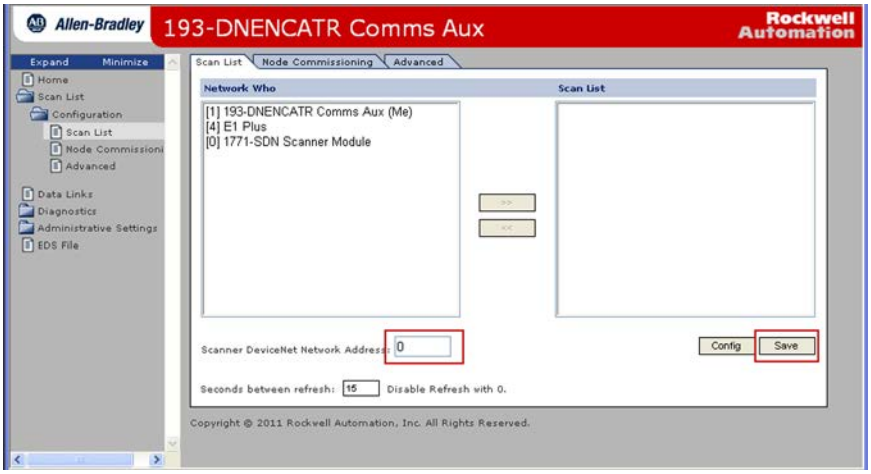
NOTE: Electronic keying is implemented on all scan list entries. Electronic keys are captured when a scan list is configured form the EtherNet/IP Communications Auxiliary webpage. The proper setting of the electronic keying becomes more important with ADR functions and replacing units in the network.

5. Navigate to Scan List>Configuration>Scan List to change the DeviceNet node address of the EtherNet/IP Communcations Auxiliary.

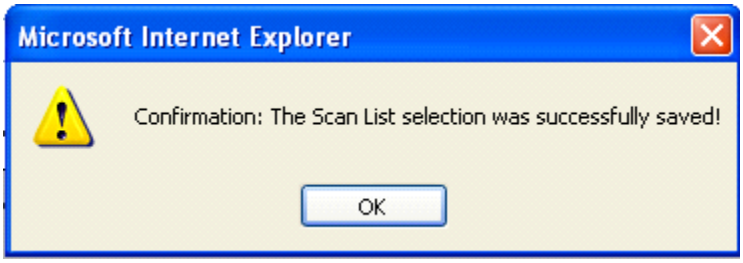


6. Change the DeviceNet network address to the appropriate node address, then click Save.

NOTE: Typically, DeviceNet scanners have the node address of 0.



7. Click OK to finish changing the scanner DeviceNet network address.



Add Devices to the DeviceNet Network

Introduction

In this chapter, you will be able to assign an address to each DeviceNet module and configure the DeviceNet scanner to scan up to six modules.

DeviceNet Node Addressing

Each module being added to the DeviceNet network must have a unique network mode address. A unique network node address can be created by using hardware devices (e.g., DIP and Selector Switches) or by the Node Commissioning tool from the internal web interface of the EtherNet/IP Communications Auxiliary.

The following chart shows the recommended node addresses.

Table 5 - Recommended Node Addresses

Assign this Device:	This Node Address:	Notes:
Scanner	0	• For multiple scanners, assign the lowest addresses in sequence (0, 1...).
Any Device on the Network (except the scanner)	1...61	• Give the lower addresses to devices with 15 bytes or more of input or output data. • Gaps between addresses are acceptable and have no effect on system performance. If the final layout of the system is not certain at this time, leave gaps between addresses to allow flexibility as the system is developed.
Computer Interface to the Network	62	• If a computer is connected directly to the DeviceNet network, use address 62 for the computer. The reason for this is that many computer interface devices use 63 as the default address. • The 1784-U2DN device can connect a computer directly to a DeviceNet network.
New DeviceNet Module	63	• To avoid conflict, always leave address 63 open. This is due to the following: – most DeviceNet devices have a factory preset address of 63. – leaving address 63 open allows for configuration of a new device. – the auto-address recovery feature requires address 63 to be open. • Some devices do not have switches or push buttons to set the address. Therefore, the device must first be connected to the network then software (e.g., RSNetworx for DeviceNet) must be used to change the address. • If another device is already using address 63, an address conflict will occur and communication will not occur with the newly connected device.

Node Address Basics

- Verify the node address assigned to the new device.
- Prevent duplicate node address assignments.
  - When connecting new DeviceNet modules with the Node Commissioning tool from the EtherNet/IP Communications Auxiliary web interface, place one new DeviceNet module on the network at a time. Refer to "New DeviceNet Module" in Table 5 on page 35.
  - If DIP or selector switches on hardware will be used, set the network node address for the device **before** connecting it to the network.
- Leave node address 63 open.

For more information about setting the node address for DeviceNet devices, refer to the Rockwell Automation Literature Library at:

www.rockwellautomation.com/literature

Set the Node Address

Using the Hardware Mechanism

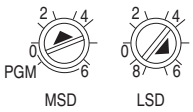
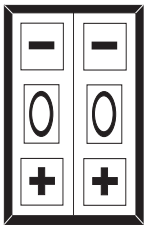
Many DeviceNet devices feature a hardware mechanism to set the network node address (e.g., a rotary switch or a push wheel switch). Use the following procedure to set the node address.

IMPORTANT	Ensure each device's node address set by the hardware mechanism matches the node address used in the DeviceNet network. Note that if the network node address is set higher than 63, the Ethernet /IP Communications Auxiliary Node Commissioning tool can be used instead of the hardware mechanism.

IMPORTANT	In order for the node address change to take effect, cycle the module's power.

1. Using Table 5 on page 35 as a guide, select a node address to apply to the new device.

2. Change the node address using the appropriate mechanism for the new device.

Mechanism	Procedure
Rotary Switch 	Turn the rotary switch dials to the desired node address value. Usually, a small, flathead screwdriver is needed to turn the dials. Once the device is powered up, the rotary switch settings are recognized. If the set node address value needs to be changed, power down the device, turn the dials to the desired setting, then power up the device again.
Push Wheel Switch 	Turn the push wheel to the desired node address value.

Using the DeviceNet Node Commissioning Tool

A device's network node address can be set using the Node Commissioning Tool on the EtherNet/IP Communications Auxiliary web page. This tool uses the Network Who to view the DeviceNet modules on the network.

Refer to the following guidelines when using the Network Commissioning tool.

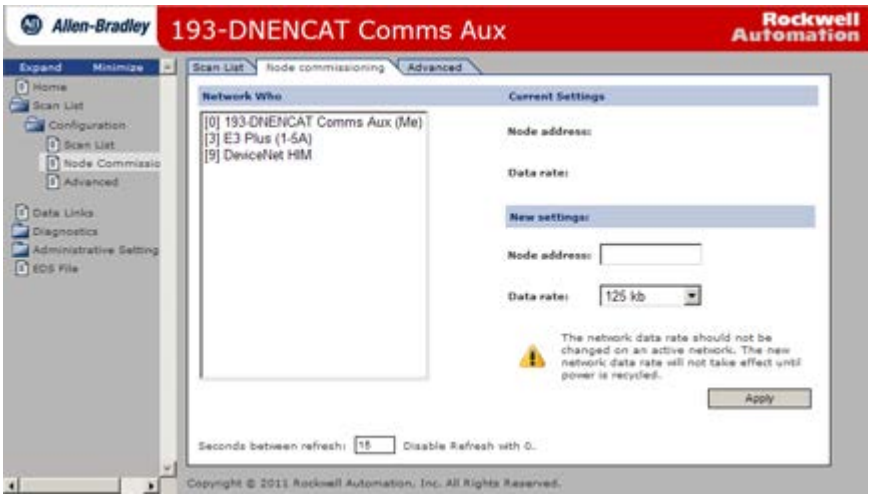
- Only use this tool with an online DeviceNet network.
- Only use this tool when adding new devices to the network if :
  - the new device **does not** feature a hardware mechanism to set the node address **or**
  - the new device's node address is set higher than 63.

  NOTE: If the new device features a hardware mechanism and the node address is set at 63 or lower, the Network Commissioning tool **does not** change the device's node address.

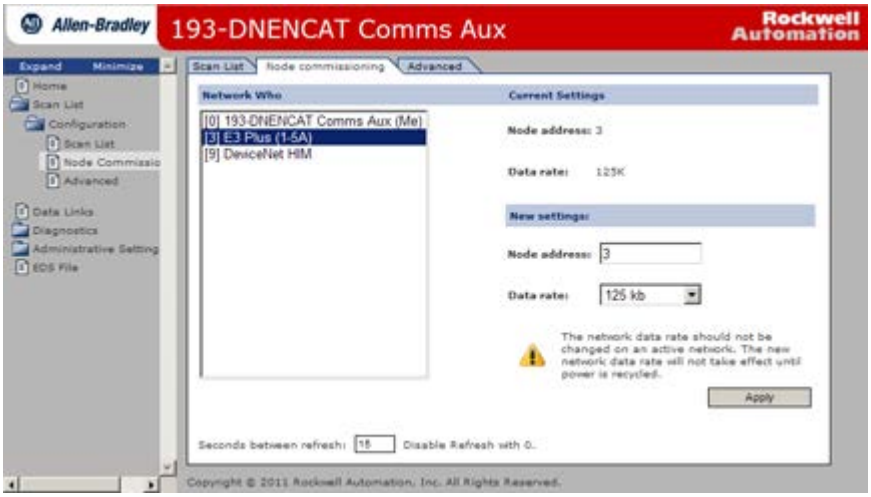
- Each time a new device is added to the DeviceNet network, the procedures beginning on page 38 **must** be performed.
- To avoid conflict with duplicate node addresses, due largely in part to modules having a factory node setting of 63, configure a module to the online DeviceNet network one a time.
- Record the node address for each device that is set by the Node Commissioning Tool.

Complete the following steps to set a device's node address using the Node Commissioning Tool on the EtherNet/IP Communications Auxiliary web page.

1. From the EtherNet/IP Communications Auxiliary web page, navigate to Scan List>Configuration>Node Commissioning.

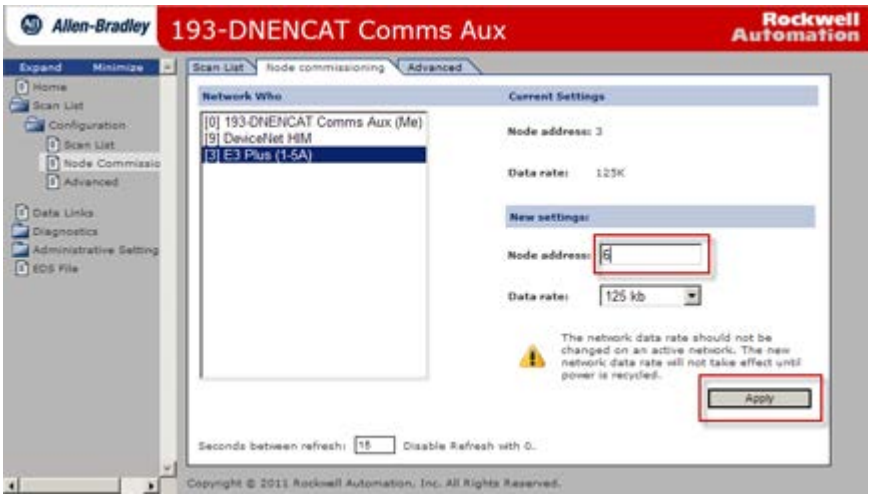


2. Select the device where node address needs to be assigned. Once selected, the Current Settings aand New Settings areas are populated.

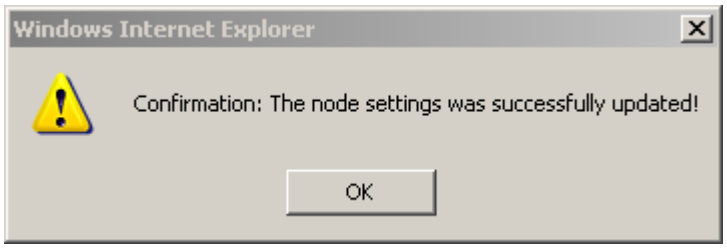


3. Double-click the “Node address” field’s value. The value will be highlighted in blue.

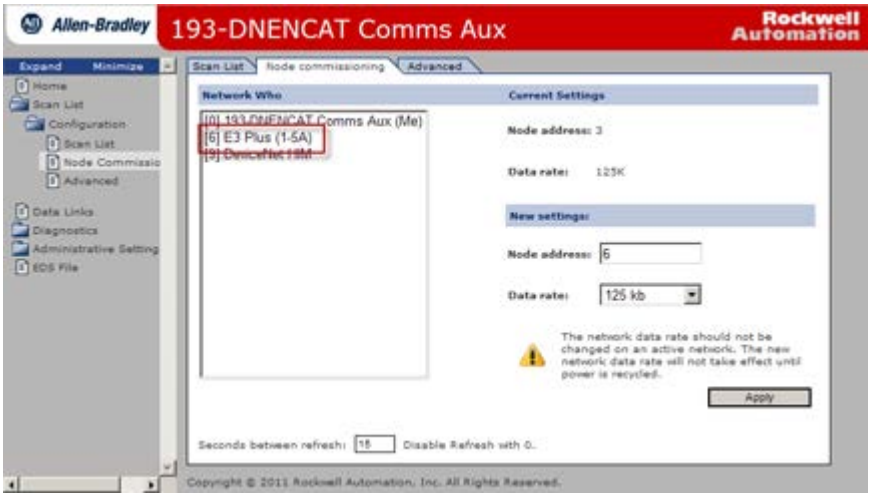
4. Using the keypad on the PC keyboard, change the network node address to the desired value. Ensure the desired value is not duplicating any other device's node address, then click the Apply button.


Allen-Bradley
193-DNENCAT Comms Aux
Rockwell Automation
Scan List
Node commissioning
Advanced
Network Who
Current Settings
[0] 193-DNENCAT Comms Aux (Me)
[9] DeviceNet HIM
[3] E3 Plus (1-5A)
Node address: 3
Data rate: 125K
New settings:
Node address: 6
Data rate: 125 kb
The network data rate should not be changed on an active network. The new network data rate will not take effect until power is recycled.
Apply
Seconds between refresh: 15
Disable Refresh with 0.
Copyright © 2011 Rockwell Automation, Inc. All Rights Reserved.

5. The following window will appear confirming a successful node address value change. Click OK.



6. Verify the node address was changed to the desired value in the "New settings" section of the page. Note that the "Current settings" area will still display the old node address unitl the device is selected again from the Network Who list.


Allen-Bradley
193-DNENCAT Comms Aux
Rockwell Automation
Scan List
Node commissioning
Advanced
Network Who
Current Settings
[0] 193-DNENCAT Comms Aux (Me)
[6] E3 Plus (1-5A)
Node address: 3
Data rate: 125K
New settings:
Node address: 6
Data rate: 125 kb
The network data rate should not be changed on an active network. The new network data rate will not take effect until power is recycled.
Apply
Seconds between refresh: 15
Disable Refresh with 0.
Copyright © 2011 Rockwell Automation, Inc. All Rights Reserved.

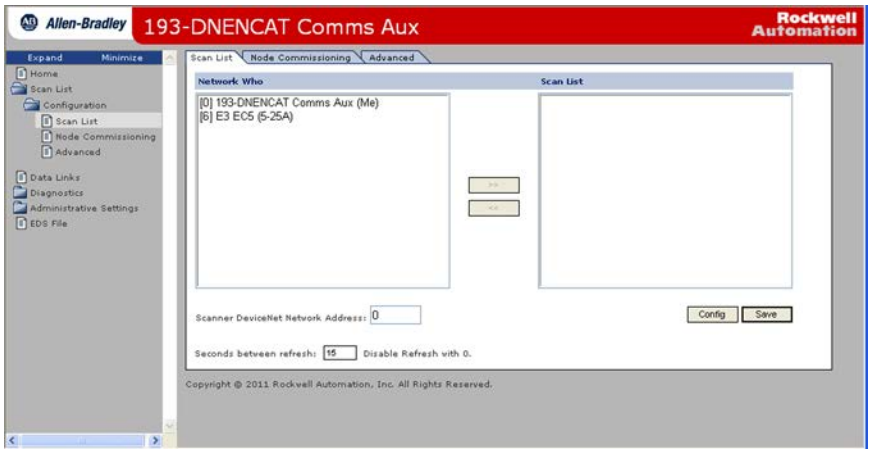
7. Repeat steps 1 through 6 until all new or additional devices are added to the DeviceNetwork.

Add DeviceNet Modules to the Scan List

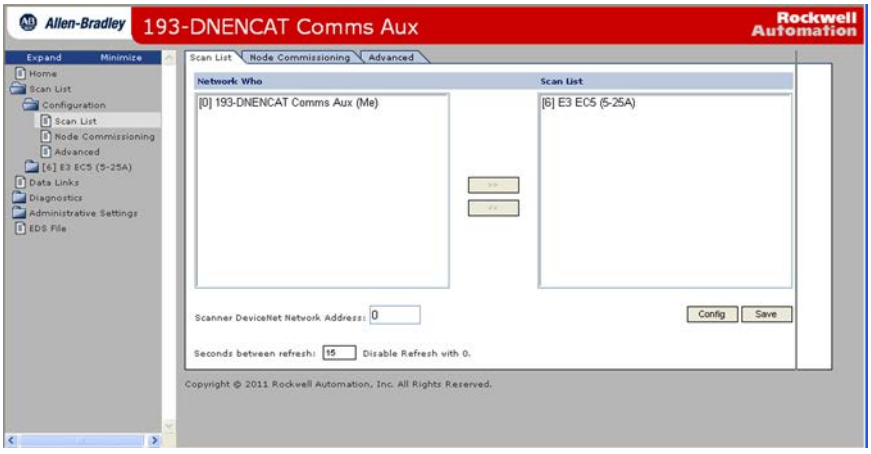
After each DeviceNet device has been assigned a unique node address, up to six DeviceNet devices can be added to the EtherNnet/IP Communications Auxiliary DeviceNet scan list. The EtherNet/IP Communications Auxiliary provide two methods to configure the scan list, Simple and User-Defined.

Simple

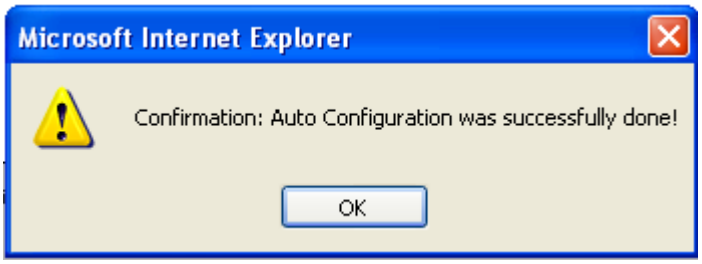
1. From the EtherNet/IP Communications Auxiliary web page, navigate to Scan List>Configuration>Scan List. The EtherNet/IP Communications Auxiliary will read the available DeviceNet modules on the DeviceNet network.



2. Click Config. The lowest six DeviceNet node addresses will populate into the Scan List field on the right.



3. Click OK to complete the configuration.

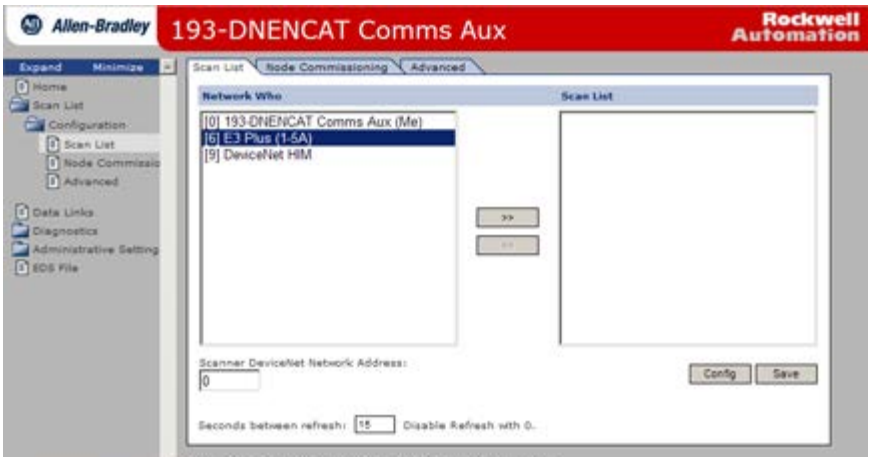


The DeviceNet scanner on the EtherNet/IP Communications Auxiliary will begin scanning the DeviceNet devices.

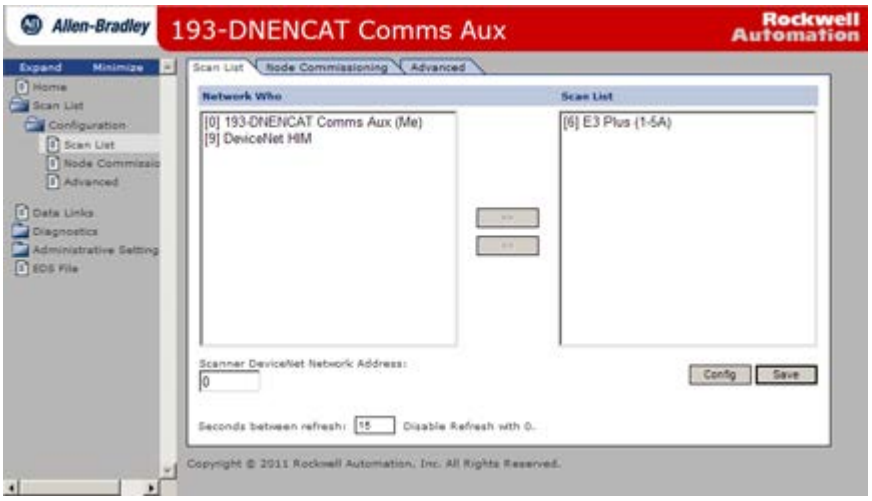
User-Defined

If there are more than six DeviceNet devices on the network, the user can select up to six DeviceNet devices to scan. Follow the steps below to select specific DeviceNet devices for the scan list.

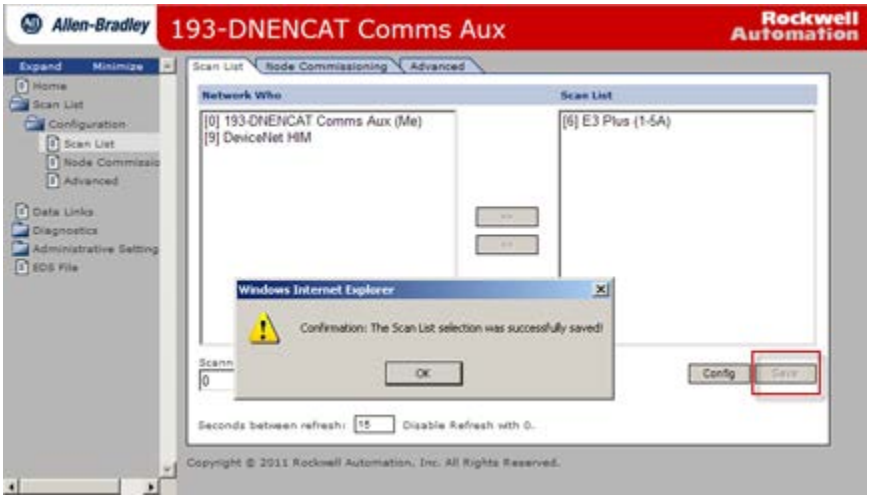
1. From the EtherNet/IP Communications Auxiliary web page, navigate to Scan List>Configuration>Scan List. The EtherNet/IP Communications Auxiliary will read the available DeviceNet modules on the DeviceNet network.
2. Select the DeviceNet device in the Network Who screen to be added to the Scan List. The >> button becomes highlighted.



3. Click >> to move the selected device into the Scan List.



4. Repeat steps 2 and 3 to add five additional DeviceNet devices.
5. Click Save at the bottom right of the screen.
6. Click OK to complete the scan list configuration.



View & Configure Parameters

Introduction

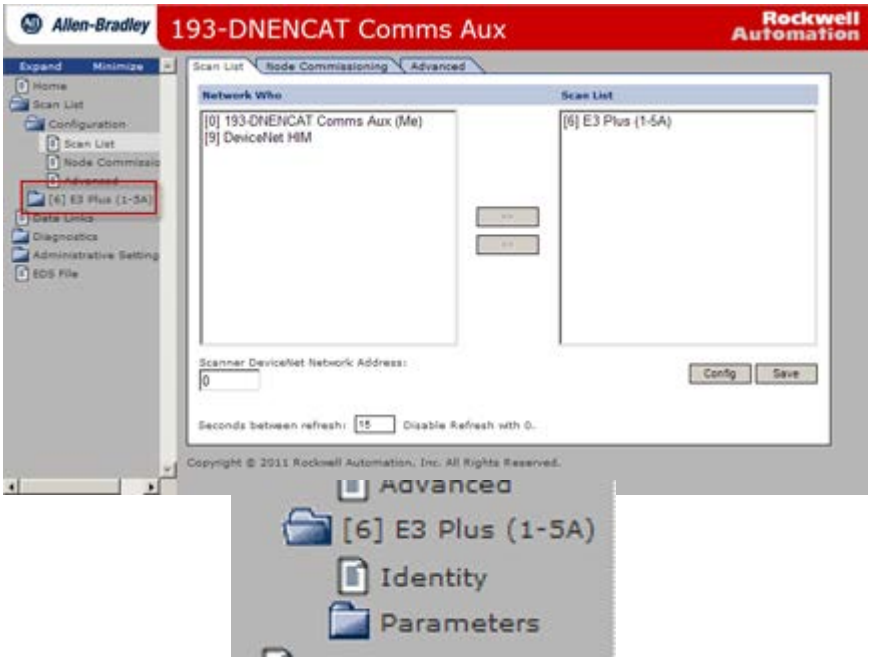
In this chapter, you will be able to view and configure parameters for a DeviceNet device that supports the full implementation of the Parameter Object.

View & Edit

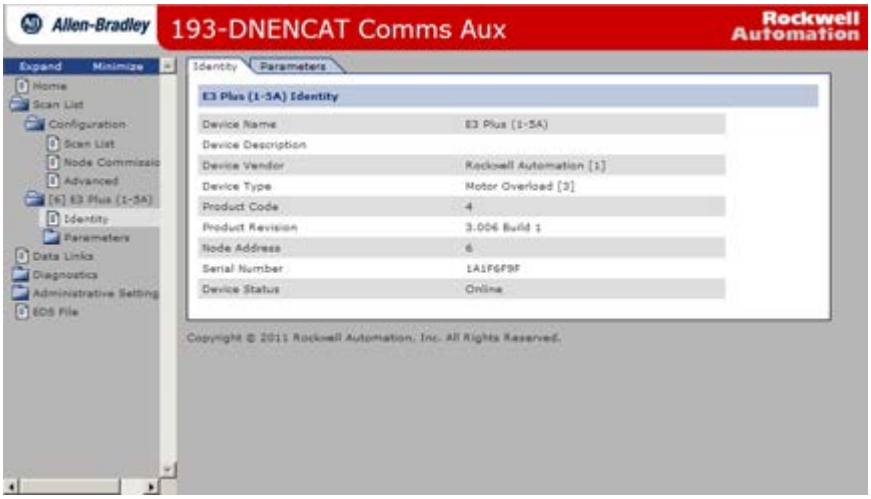
The EtherNet/IP Commuications Auxiliary is able to view and configure parameters for a DeviceNet device that supports the full implementation of the Parameter Object. Users can use the web interface to view and edit parameters for a DeviceNet Module in the scan list.

Follow the steps below to view and edit parameters using the web interface of the EtherNet/IP Commuications Auxiliary.

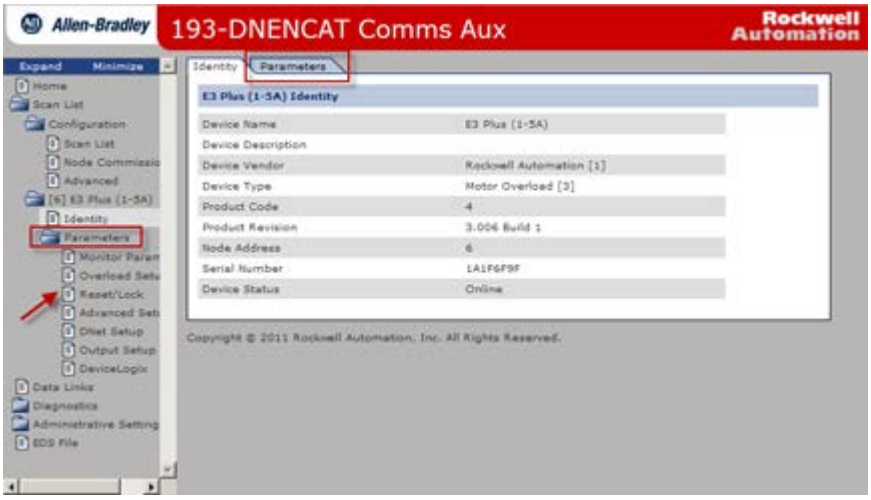
1. Navigate to Scan List>Configuration, then select the DeviceNet device folder to view or edit its parameters. The selected DeviceNet device folder will expand.



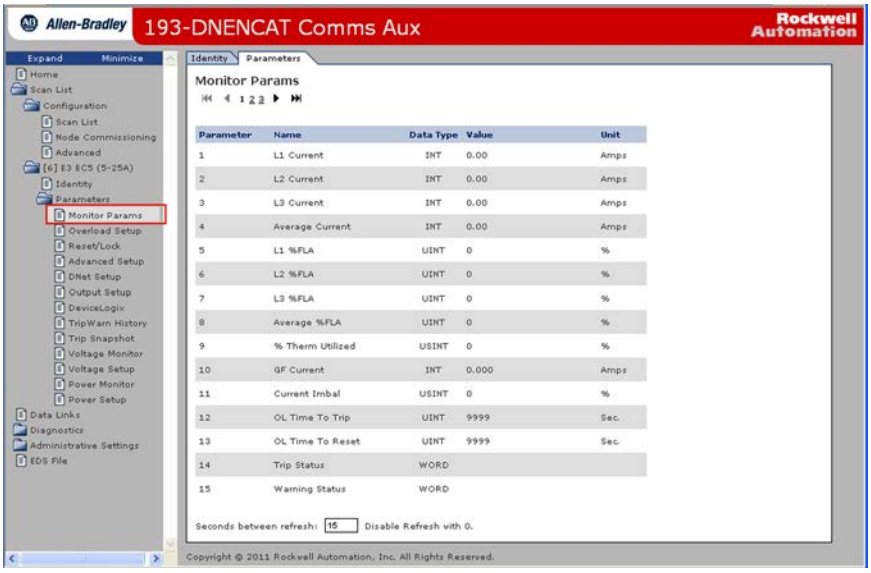
2. Click on the Identity folder. The Identity tab will appear, providing information about the selected device.



3. Click on the Parameter folder. Subfields for this folder will appear.

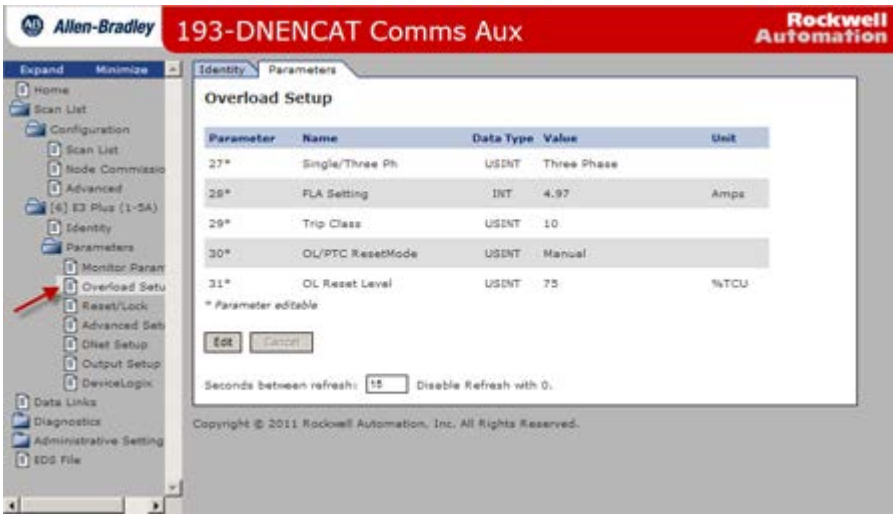


4. Select a parameter group. A list of up to 15 parameters will be displayed. If more than 15 parameters are available, select the page number or use the navigation arrows to view the additional parameter screens.

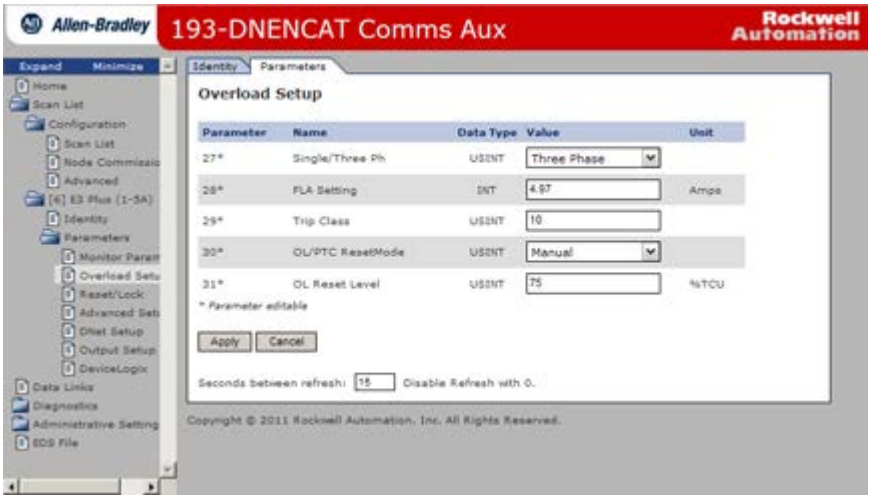


TIP To increase the update rate of the data being displayed on the screen, lower the value in the "Seconds before refresh:" field.

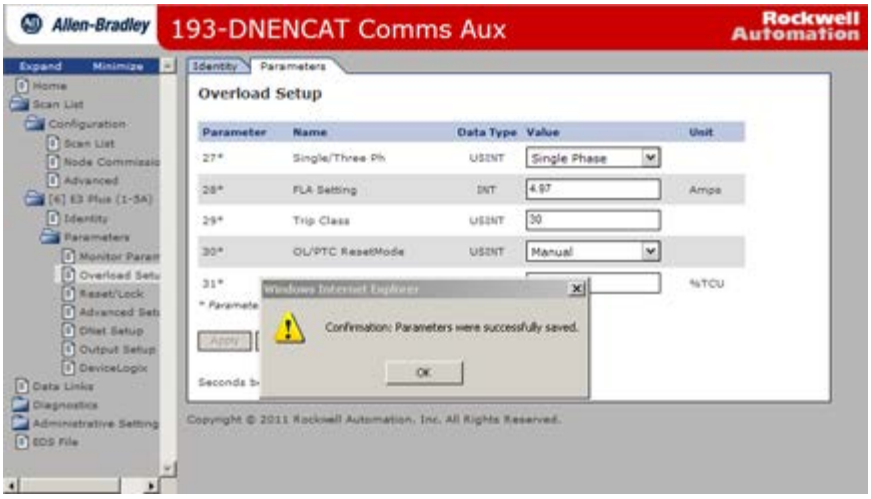
5. Select a parameter group that contains programmable parameters, then click the Edit button. The value options will appear.



6. Click the down arrow on the pull-down boxes to adjust fixed values and/or enter numerical values in the fields without an arrow to adjust the values.



7. Click Apply once all parameter edits have been completed. The EtherNet/IP Communications Auxiliary will download the new parameter values to the device. A confirmation window will appear.



8. Click OK.
9. Continue editing the remaining parameters, if desired.

NOTE: If a DeviceNet module does not support the parameter object, the following window will appear:

Automatic Device Recovery or Replace

Introduction

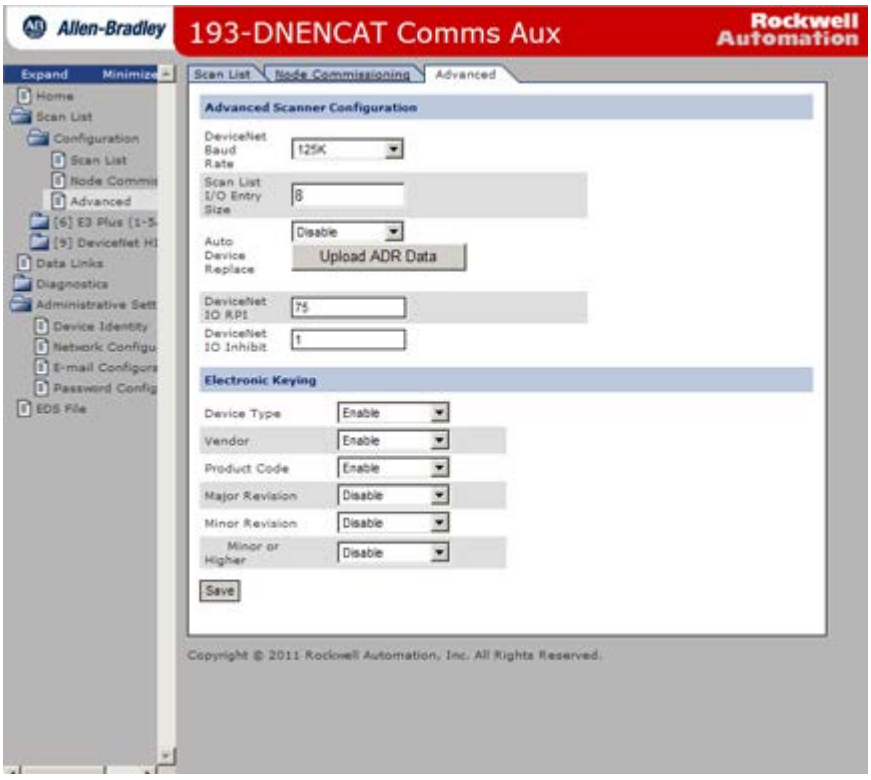
In this chapter, using the Automatic Device Recovery or Replace (ADR) will be explained. The use of this feature reduces downtime if a device needs to be replaced.

With ADR, there is no need for software tools to get a replacement device configured and online. The EtherNet/IP Communications Auxiliary automatically configures the replacement device if the device was listed in the scan list and the appropriate electronic keying was selected.

IMPORTANT Not all DeviceNet devices support ADR.

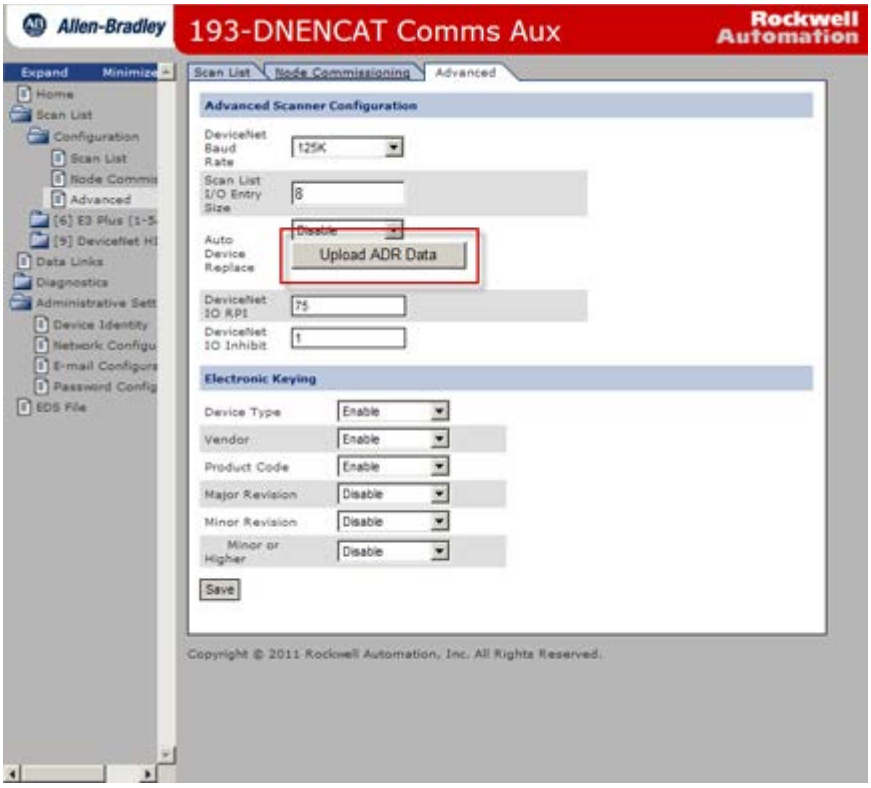
Setting ADR

1. Navigate to Scan List>Configuration>Advanced.
2. Select the appropriate electronic keying for your DeviceNet network application.



By default, the Device Type, Vendor, and Product Code will be enabled. Electronic keying will define how closely a replacement device must match a failed device before the EtherNet/IP Auxiliary reconfigures a module. If the new module does not match the criteria of one of the checked boxes, the ADR will not function and an ADR error will appear.

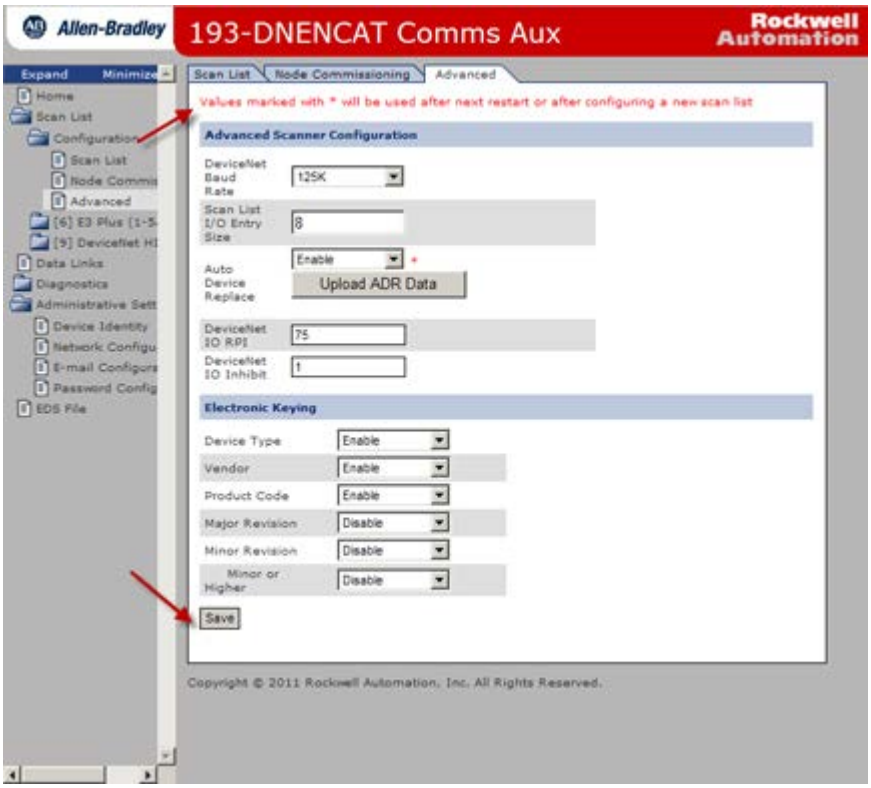
3. Once the scan list and DeviceNet module programmable parameters have been configured, click Upload ADR Data.



The EtherNet/IP Communications Auxiliary will upload and store the configuration data from the modules in the scan list and a confirmation message will appear,

4. Select Enable from the Auto Device Replace pull-down menu. This will enable the ADR.

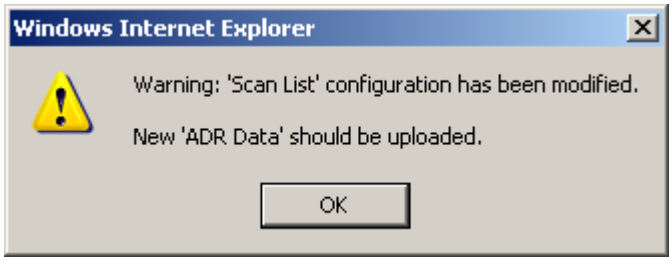
5. Click Save, then cycle power on the EtherNet/IP Communications Auxiliary.



An ADR download is performed immediately before an I/O connection is allocated by the DeviceNet master.

If the download is unsuccessful, an "ADR Error" for the appropriate node will be reported in the corresponding "Scan List Entry Status Word". If the electronic keys for the device at a given node address do not match the saved electronic keys, no ADR download will take place, an I/O connection will not be allocated, and a "Keying Mismatch" will be reported in the corresponding "Scan List Entry Status Word".

A warning list will appear after enabling the ADR and a change has been made to the scan list.



AAR (Auto Address Recovery) is also supported by the EtherNet/IP Communications Auxiliary. When the EtherNet/IP Communications Auxiliary detects a node is missing from the scan list and a module matching the electonic

key is detected on node 63, the EtherNet/IP Communications Auxiliary will attempt to change the module's network node address to that of the missing scan list node number. When successful, the EtherNet/IP Communications Auxiliary will download the ADR information to the module.

Automation Controller Communications

Introduction

This chapter describes and gives examples of how each type of EtherNet/IP messaging, I/O messaging and Explicit messaging, is used.

Ethernet Messaging

The EtherNet/IP Communications Auxiliary supports two types of EtherNet/IP messaging.

- I/O Messaging — Used for deterministic EtherNet/IP communications with ControlLogix™, CompactLogix™, SoftLogix™, and EtherNet/IP scanners. Its primary use is to read and write I/O data for control purposes.
- Logic Explicit Messaging — Used for non-deterministic communications in which the data is not critical for control. Logic explicit messages have a lower priority compared to I/O messages and are used to read and write non-critical data.

I/O Messaging

RS Logix 5000™ software is used to configure I/O messaging between an automation controller and an EtherNet/IP Communications Auxiliary on an EtherNet/IP network.

The following example provides the steps necessary to configure a Logix controller for I/O messaging.

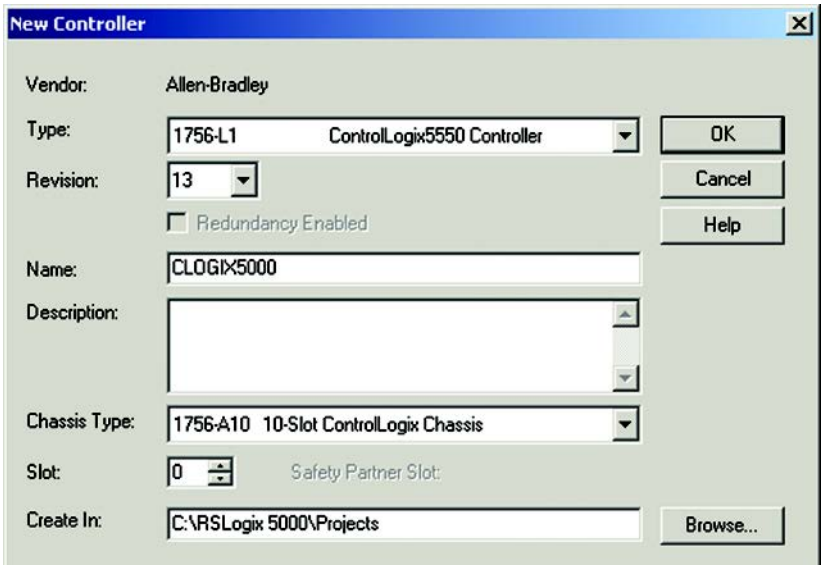
ControlLogix Configuration with Add-On Profiles

An Add-On Profile is available for the EtherNet/IP Communications Auxiliary and can be used with RSLogix 5000 version 17 and higher. The profile can be downloaded from:

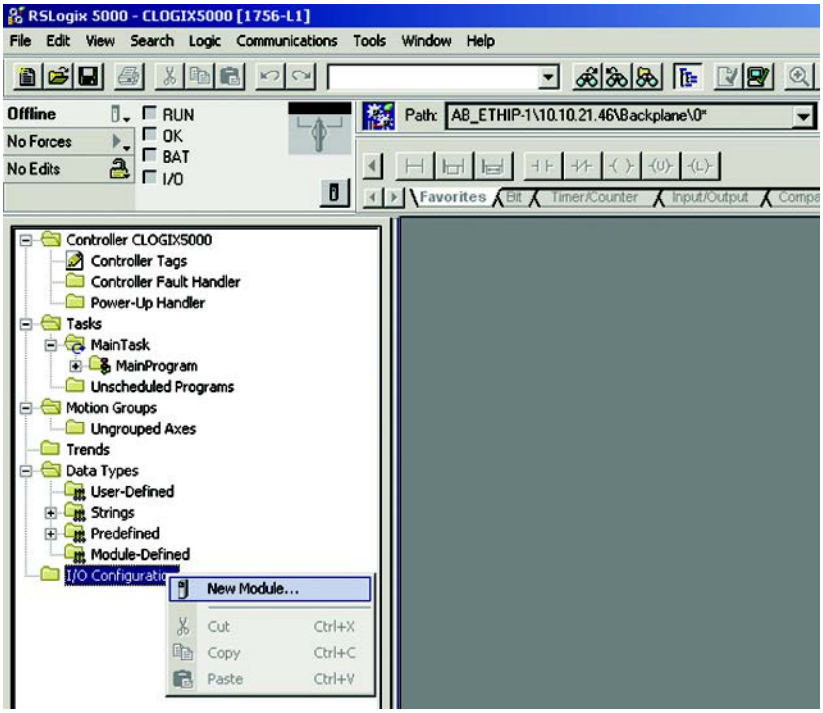
http://support.rockwellautomation.com/controlflash/LogixProfiler.asp

An existing project can be used or a new project can be created to configure EtherNet/IP I/O Messaging. To create a new project, perform the following steps.

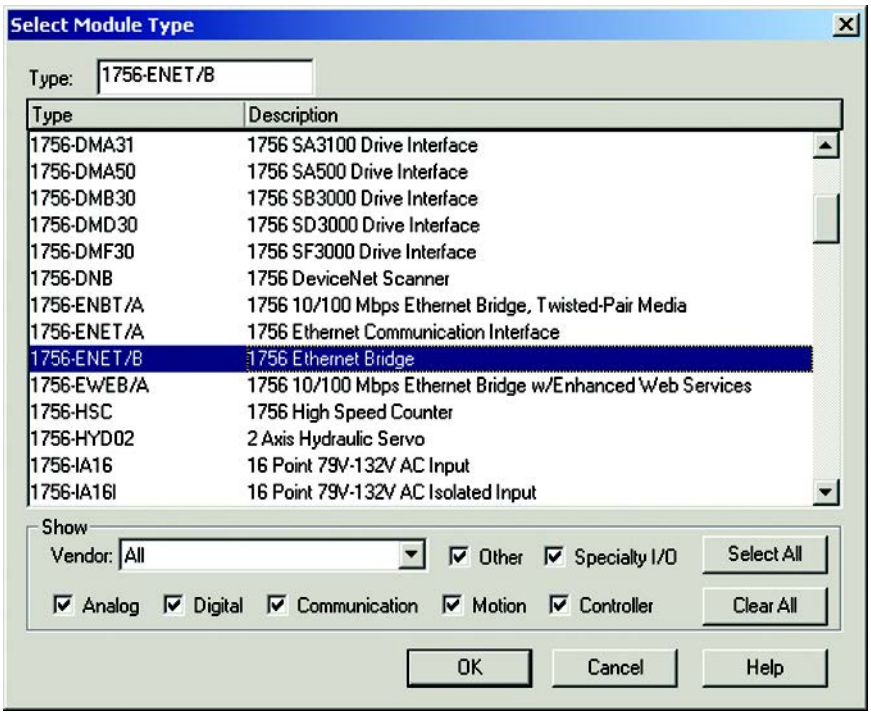
1. Select File>New from the RSLogix 5000.
2. Select the controller type, chassis type, slot number, and project path. Then, enter a name for the controller and click OK.



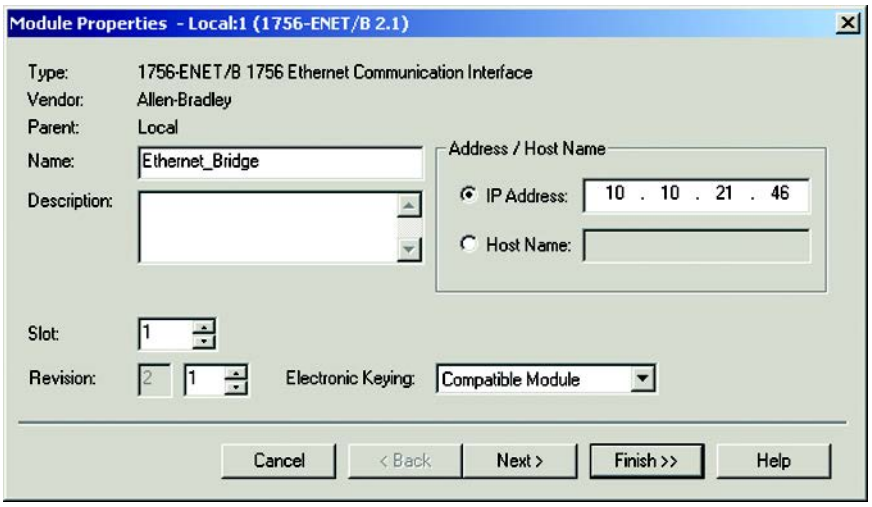
3. Right-click the I/O Configuration folder, then select New Module. The Select Module Type window will appear.



4. Select the desired EtherNet/IP scanner module, then click OK.



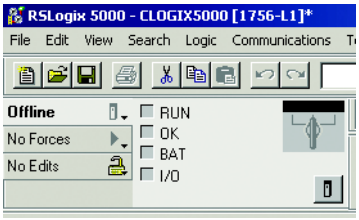
5. Enter the desired communication settings, then click Finish.



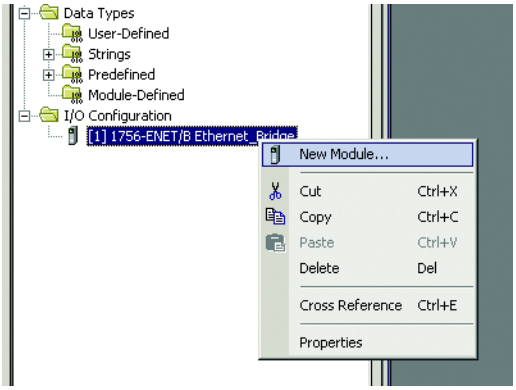
EtherNet/IP Network Configuration with Add-On Profiles

After the controller configuration, the EtherNet/IP Communications Auxiliary has to be added to the I/O configuration.

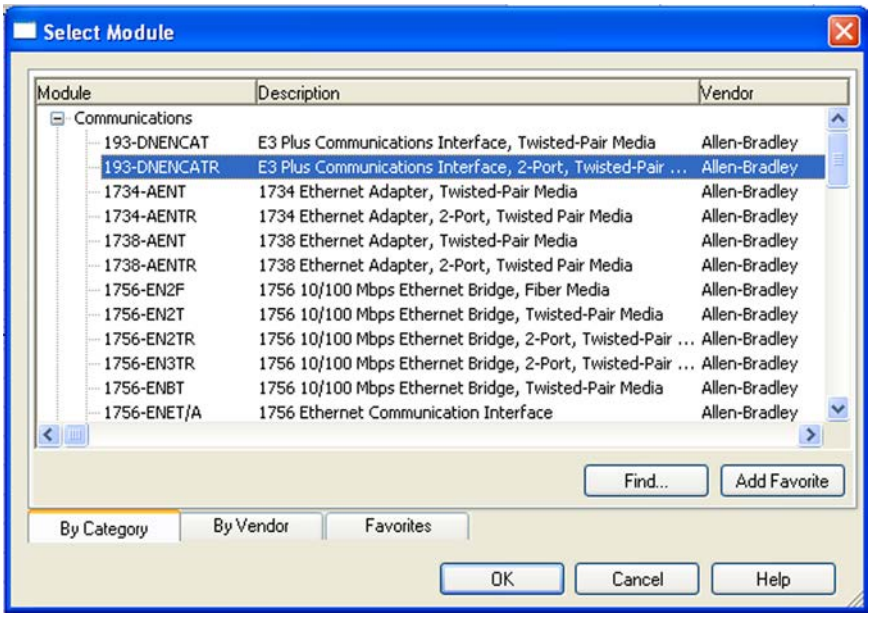
1. Place the program in offline mode.



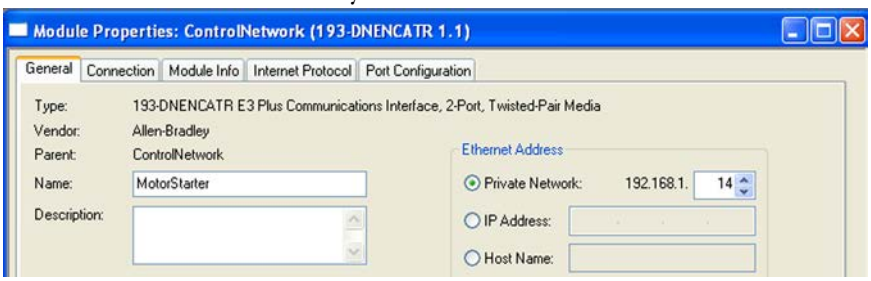
2. Right-click on the EtherNet/IP scanner within the I/O Configuration folder, then select New Module to open the Select Module Type window.



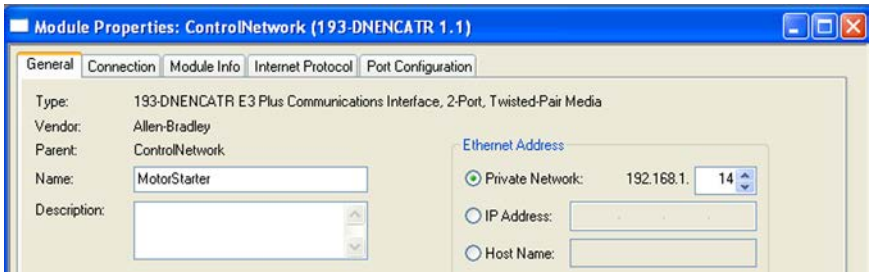
3. Select the appropriate device (either 193-DNENCAT or 193-DNENECATR, then click OK.


Select Module
Module
Description
Vendor
Communications
193-DNENCAT E3 Plus Communications Interface, Twisted-Pair Media Allen-Bradley
193-DNENCATR E3 Plus Communications Interface, 2-Port, Twisted-Pair ... Allen-Bradley
1734-AENT 1734 Ethernet Adapter, Twisted-Pair Media Allen-Bradley
1734-AENTR 1734 Ethernet Adapter, 2-Port, Twisted Pair Media Allen-Bradley
1738-AENT 1738 Ethernet Adapter, Twisted-Pair Media Allen-Bradley
1738-AENTR 1738 Ethernet Adapter, 2-Port, Twisted Pair Media Allen-Bradley
1756-EN2F 1756 10/100 Mbps Ethernet Bridge, Fiber Media Allen-Bradley
1756-EN2T 1756 10/100 Mbps Ethernet Bridge, Twisted-Pair Media Allen-Bradley
1756-EN2TR 1756 10/100 Mbps Ethernet Bridge, 2-Port, Twisted-Pair ... Allen-Bradley
1756-EN3TR 1756 10/100 Mbps Ethernet Bridge, 2-Port, Twisted-Pair ... Allen-Bradley
1756-ENBT 1756 10/100 Mbps Ethernet Bridge, Twisted-Pair Media Allen-Bradley
1756-ENET/A 1756 Ethernet Communication Interface Allen-Bradley
Find...
Add Favorite
By Category
By Vendor
Favorites
OK
Cancel
Help

4. Enter a name for the EtherNet/IP Communications Auxiliary. The name will create tags in RSLogix 5000 that can be used to read and write data from DeviceNet modules being scanned by the EtherNet/IP Communications Auxiliary.

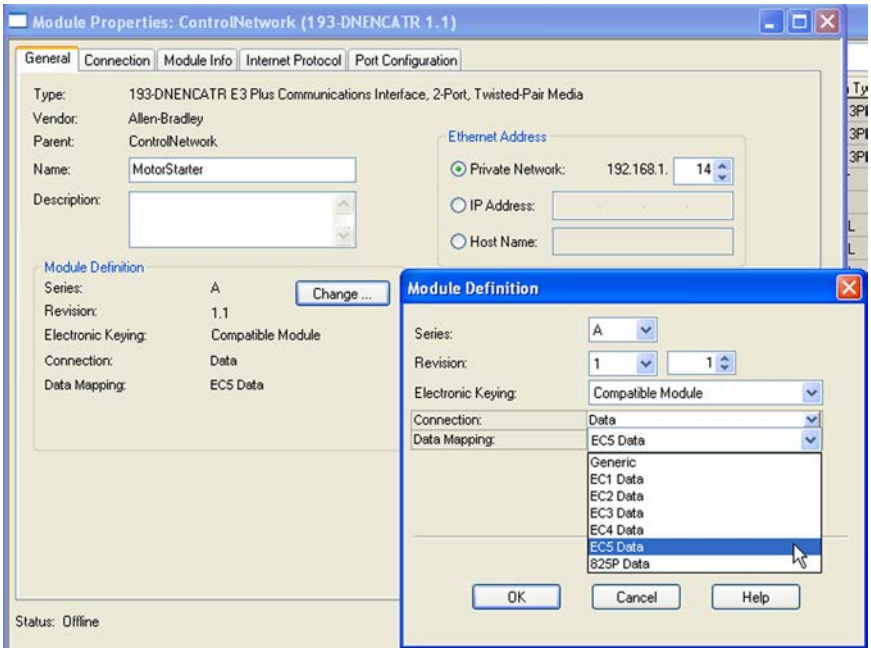


5. Enter the IP address of the EtherNet/IP Communications Auxiliary.



6. Select Change to select a motor protection device with predefined tag names for Data Mapping. For non-motor protection devices, select Generic.

NOTE: Predefined tag names exist for the E3 Plus EC1, EC2, EC3, EC4, and EC-5 models and the 825-P Overload Relay.



7. Select the appropriate data format, then click OK.

8. Click OK at the next window to have RSLogix 5000 create the predefined tags. The EtherNet/IP Communications Auxiliary will now show as a module in the I/O Configuration folder.

Accessing Module Data with Add-On Profiles

With both the Logix controller and EtherNet/IP network configured, the Logix controller can exchange data with the EtherNet/IP Communication Auxiliary.

1. Open the Controller Tags window.

2. Select the Monitor Tags tab.

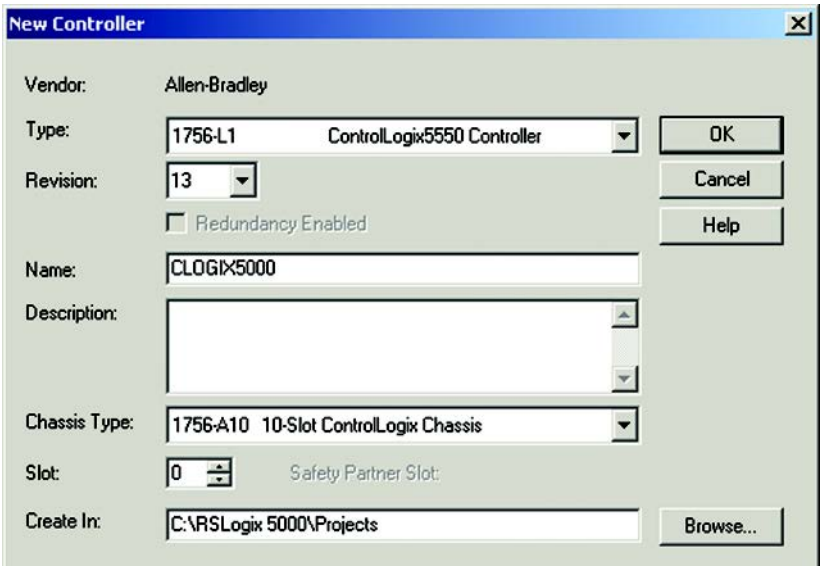
MotorStarter:I.EC5	{...}	{...}	
MotorStarter:I.EC5[0]	{...}	{...}	
MotorStarter:I.EC5[0].TripPresent	0		Decimal
MotorStarter:I.EC5[0].WarningPresent	0		Decimal
MotorStarter:I.EC5[0].OutputA	0		Decimal
MotorStarter:I.EC5[0].OutputB	0		Decimal
MotorStarter:I.EC5[0].Input1	0		Decimal
MotorStarter:I.EC5[0].Input2	0		Decimal
MotorStarter:I.EC5[0].Input3	0		Decimal
MotorStarter:I.EC5[0].Input4	0		Decimal
MotorStarter:I.EC5[0].MotorCurrentPresent	0		Decimal
MotorStarter:I.EC5[0].GroundFaultCurren...	0		Decimal
MotorStarter:I.EC5[0].Input5	0		Decimal
MotorStarter:I.EC5[0].Input6	0		Decimal
MotorStarter:I.EC5[0].MotorVoltagePresent	0		Decimal
MotorStarter:I.EC5[0].L1Current	0		Decimal
MotorStarter:I.EC5[0].L2Current	0		Decimal
MotorStarter:I.EC5[0].L3Current	0		Decimal
MotorStarter:I.EC5[1]	{...}	{...}	
MotorStarter:I.EC5[2]	{...}	{...}	
MotorStarter:I.EC5[3]	{...}	{...}	
MotorStarter:I.EC5[4]	{...}	{...}	
MotorStarter:I.EC5[5]	{...}	{...}	
MotorStarter:I.AdvancedDataEC5	{...}	{...}	
MotorStarter:O	{...}	{...}	
MotorStarter:O.EC5	{...}	{...}	
MotorStarter:O.EC5[0]	{...}	{...}	
MotorStarter:O.EC5[0].OutputAData	0		Decimal
MotorStarter:O.EC5[0].OutputBData	0		Decimal
MotorStarter:O.EC5[0].ResetTrip	0		Decimal
MotorStarter:O.EC5[0].RemoteTrip	0		Decimal

In the above example, the predefined input and output tags were generated for each of the six scanned devices. To control the output relays for the scanned device, use the output tags. For diagnostic informaton from the device, use the input tags.

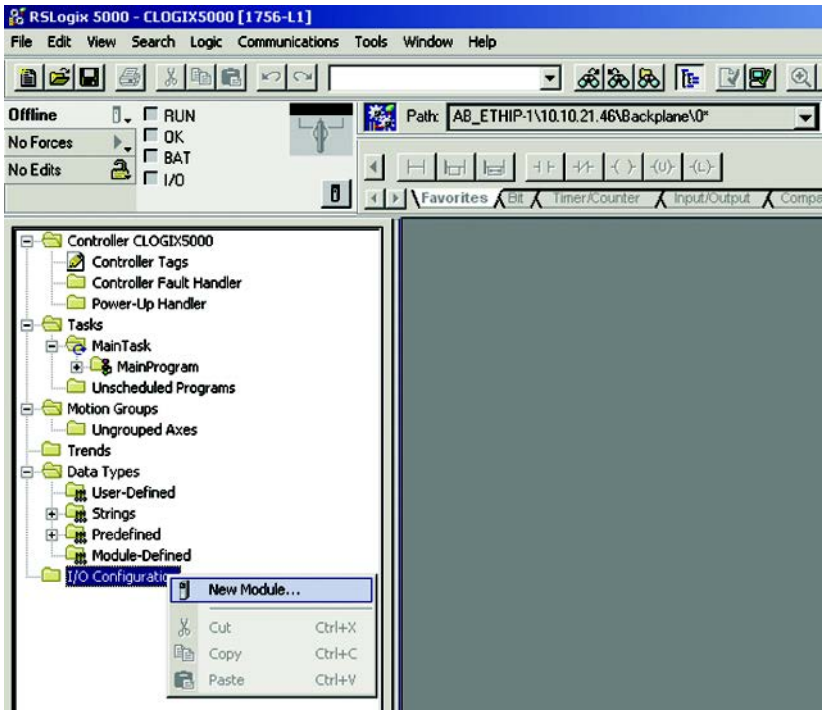
ControlLogix Generic Configuration

An existing project can be used or a new project can be created to configure EtherNet/IP I/O Messaging. To create a new project, perform the following steps.

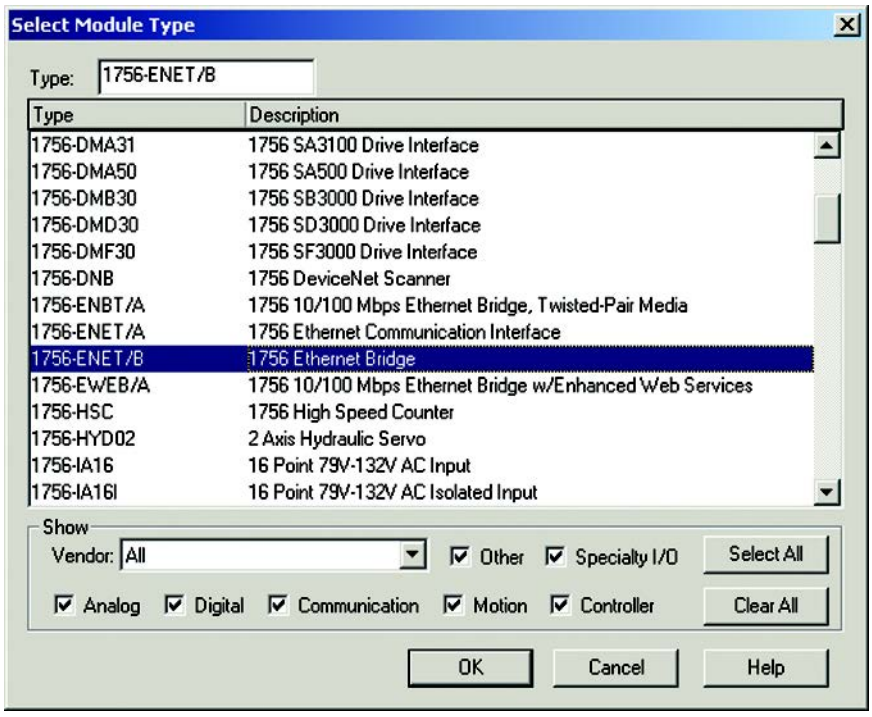
1. Select File>New from the RSLogix 5000.
2. Select the controller type, chassis type, slot number, and project path. Then, enter a name for the controller and click OK.



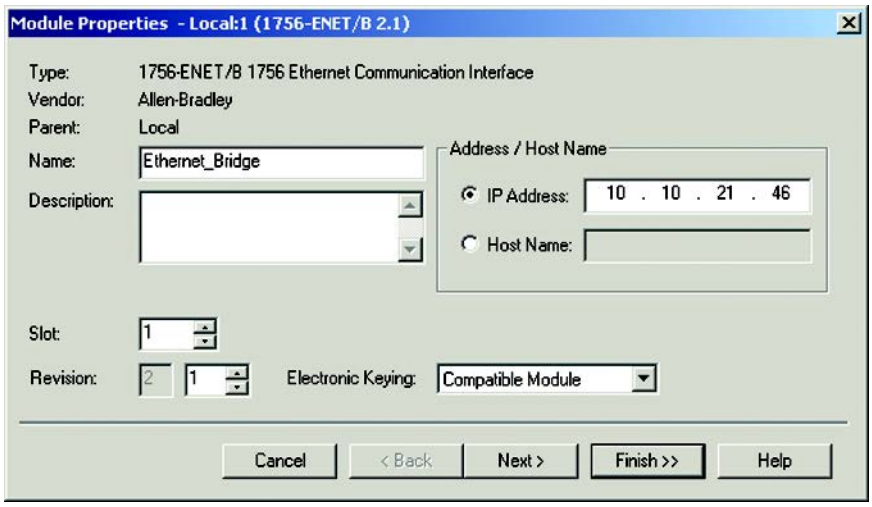
3. Right-click the I/O Configuration folder, then select New Module. The Select Module Type window will appear.



4. Select the desired EtherNet/IP scanner module, then click OK.



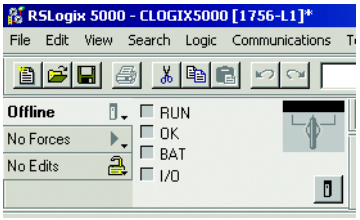
5. Enter the desired communication settings, then click Finish.



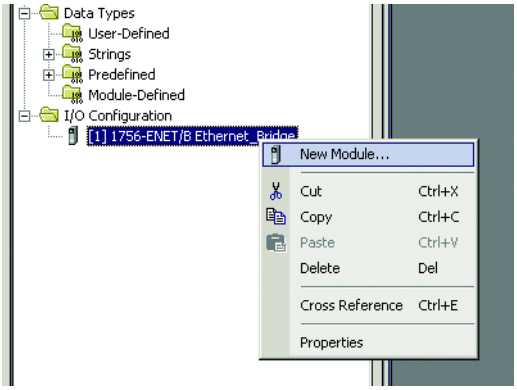
EtherNet/IP Generic Module Configuration

Once the Logix controller has been configured, the EtherNet/IP Communications Auxiliary must be added to the I/O configuration.

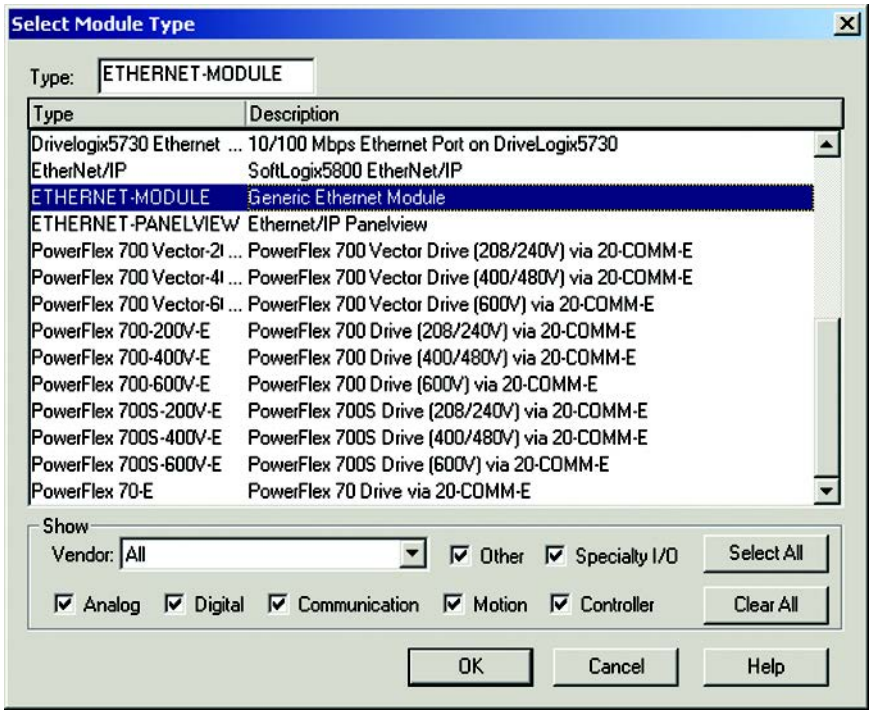
1. Place the program in offline mode.



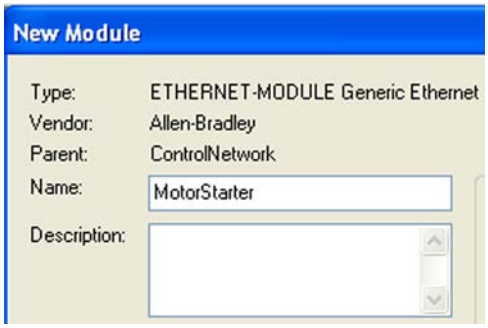
2. Right-click on the EtherNet/IP scanner within the I/O Configuration folder, then select New Module to open the Select Module Type window.



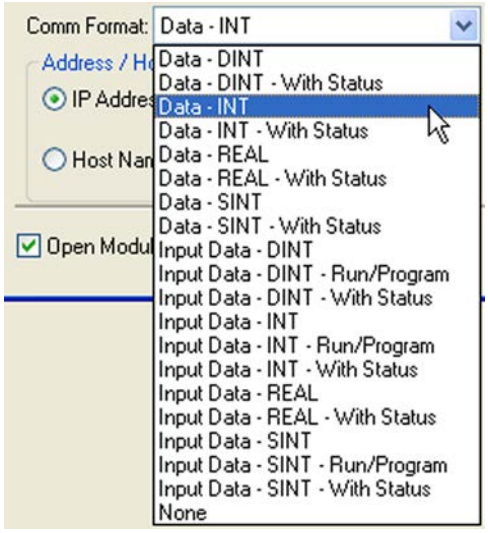
3. Select Generic Ethernet Module, then click OK.


Select Module Type
Type: ETHERNET-MODULE
Type
Description
Drivelogix5730 Ethernet ... 10/100 Mbps Ethernet Port on DriveLogix5730
EtherNet/IP SoftLogix5800 EtherNet/IP
ETHERNET-MODULE Generic Ethernet Module
ETHERNET-PANELVIEW Ethernet/IP Panelview
PowerFlex 700 Vector-2I ... PowerFlex 700 Vector Drive (208/240V) via 20-COMM-E
PowerFlex 700 Vector-4I ... PowerFlex 700 Vector Drive (400/480V) via 20-COMM-E
PowerFlex 700 Vector-6I ... PowerFlex 700 Vector Drive (600V) via 20-COMM-E
PowerFlex 700-200V-E PowerFlex 700 Drive (208/240V) via 20-COMM-E
PowerFlex 700-400V-E PowerFlex 700 Drive (400/480V) via 20-COMM-E
PowerFlex 700-600V-E PowerFlex 700 Drive (600V) via 20-COMM-E
PowerFlex 700S-200V-E PowerFlex 700S Drive (208/240V) via 20-COMM-E
PowerFlex 700S-400V-E PowerFlex 700S Drive (400/480V) via 20-COMM-E
PowerFlex 700S-600V-E PowerFlex 700S Drive (600V) via 20-COMM-E
PowerFlex 70-E PowerFlex 70 Drive via 20-COMM-E
Show
Vendor: All
Other
Specialty I/O
Select All
Analog
Digital
Communication
Motion
Controller
Clear All
OK
Cancel
Help

4. Enter a name for the EtherNet/IP Communications Auxiliary. The name will create a tag in RSLogix 5000 that can be used to read and write data from the devices being scanned by the EtherNet/IP Communication Auxiliary.

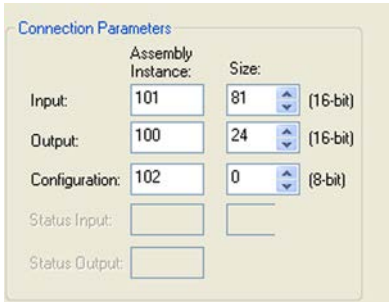


5. Select Data-INT for the Comm Format. The Data-INT format wil l represent the data from the EtherNet/IP Communications Auxiliary as a field of 16-bit values.

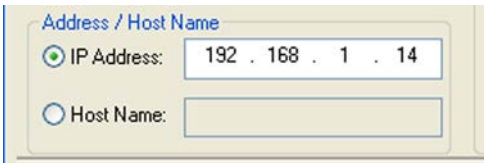

Comm Format:
Data - INT
Data - DINT
Data - DINT - With Status
Data - INT
Data - INT - With Status
Data - REAL
Data - REAL - With Status
Data - SINT
Data - SINT - With Status
Input Data - DINT
Input Data - DINT - Run/Program
Input Data - DINT - With Status
Input Data - INT
Input Data - INT - Run/Program
Input Data - INT - With Status
Input Data - REAL
Input Data - REAL - With Status
Input Data - SINT
Input Data - SINT - Run/Program
Input Data - SINT - With Status
None

6. Set the Connection Parameters. I/O data is accessed using Input Instance 101 and Output Instance 100. The size of the input connection and the output connection shall correspond to the size of the chosen instance. The configuration assembly instance is 102.

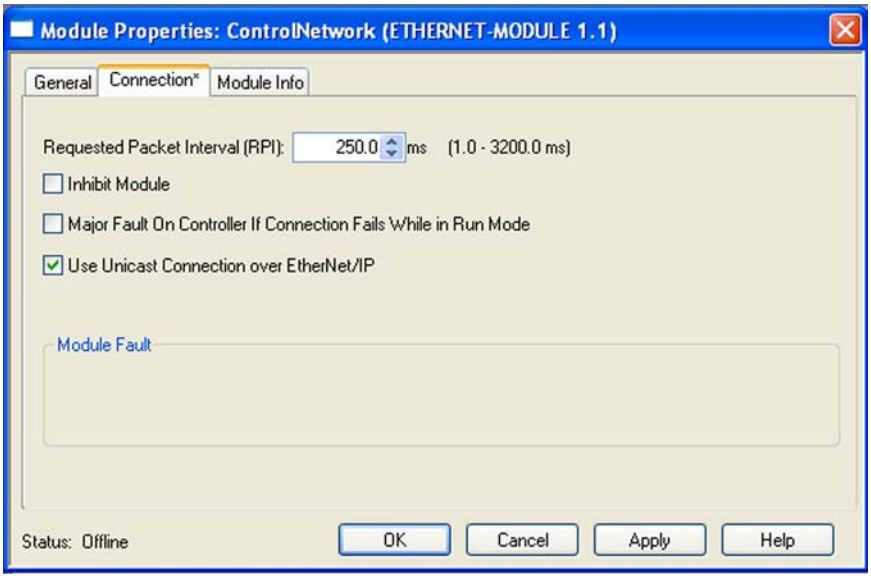
NOTE: In this example, configuration data is not used. Thus, the data size is set to 0



7. Type the IP address of the EtherNet/IP Communications Auxiliary.



8. Type the value for the time between each scan of the module. The recommended RPI time is 250 ms. Ensure that the Inhibit Module is not checked.

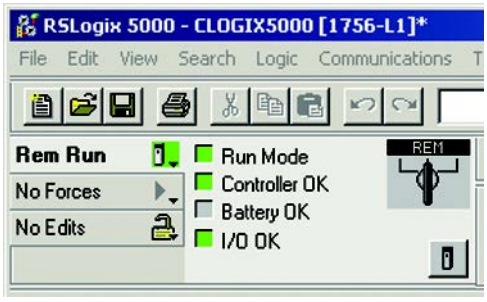


9. Click OK to add the EtherNet/IP Communications Auxiliary to the I/O Configuration in RSLogix 5000.

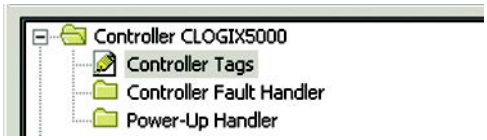
Accessing Generic Module Data

With both the ControlLogix controller and the EtherNet/IP network configured, the ControlLogix controller can exchange data with the EtherNet/IP Communications Auxiliary.

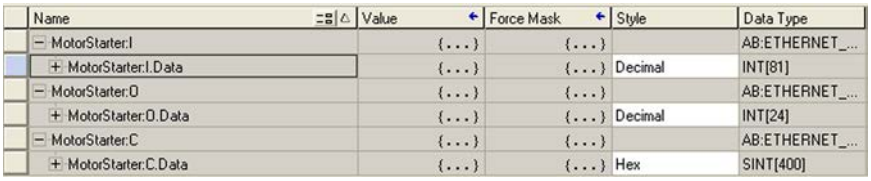
1. Go online, then switch the controller to Remote Run mode.



2. Open the Controller Tags window.



3. Select the Monitor Tags tab.



Name	Value	Force Mask	Style	Data Type
MotorStarter:I	{...}	{...}		AB:ETHERNET_...
MotorStarter:I.Data	{...}	{...}	Decimal	INT[81]
MotorStarter:O	{...}	{...}		AB:ETHERNET_...
MotorStarter:O.Data	{...}	{...}	Decimal	INT[24]
MotorStarter:C	{...}	{...}		AB:ETHERNET_...
MotorStarter:C.Data	{...}	{...}	Hex	SINT[400]

An array of input and output tags were generated for each of the six scanned devices. To control the output relays for the scanned device, use the output tags; to obtain diagnostic information from the scanned device, use the input tags.

The format of output data is shown in the table to follow.

Table 6 - Output Assembly — Instance 100

Byte Size	Contents
Scan List I/O Size	Data to be delivered to the first scan list entry.
Scan List I/O Size	Data to be delivered to the second scan list entry.
Scan List I/O Size	Data to be delivered to the third scan list entry.
Scan List I/O Size	Data to be delivered to the fourth scan list entry.
Scan List I/O Size	Data to be delivered to the fifthscan list entry.
Scan List I/O Size	Data to be delivered to the sixth scan list entry.

The format of the input data is shown in the table to follow.

Table 7 - Input Assembly — Instance 101

Byte Size	Contents
4 bytes	Logix Status Word
2 bytes	DeviceNet Scanner Status (Parameter 1) See Table 9 on page 73
2 bytes	Scan List Entry 1 Status Word (Parameter 2) See Table 10 on page 74
2 bytes	Scan List Entry 2 Status Word (Parameter 3) See Table 11 on page 74
2 bytes	Scan List Entry 3 Status Word (Parameter 4) See Table 12 on page 74
2 bytes	Scan List Entry 4 Status Word (Parameter 5) See Table 13 on page 75
2 bytes	Scan List Entry 5 Status Word (Parameter 6) See Table 14 on page 75
2 bytes	Scan List Entry 6 Status Word (Parameter 7) See Table 15 on page 75
Scan List I/O Size	Produced I/O data from the first scan list entry.
Scan List I/O Size	Produced I/O data from the second scan list entry.
Scan List I/O Size	Produced I/O data from the third scan list entry.

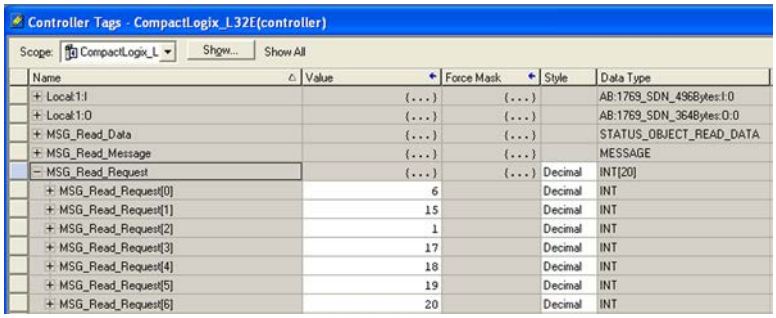
Byte Size	Contents
Scan List I/O Size	Produced I/O data from the fourth scan list entry.
Scan List I/O Size	Produced I/O data from the fifth scan list entry.
Scan List I/O Size	Produced I/O data from the sixth scan list entry.
2 bytes	Data Link 1 Data
2 bytes	Data Link 2 Data
2 bytes : :	Data Link 3 Data : :
2 bytes	Data Link 48 Data

Logic Explicit Messaging

CompactLogix, ControlLogix, and SoftLogix controllers can read and write specific information to and from DeviceNet modules on the same DeviceNet network through the EtherNet/IP Communications Auxiliary using Explicit Messaging.

The following steps configure a ControlLogix explicit message using the MSG instruction to read diagnostic parameters from an E3 Plus Model and EC5 Overload Relay.

1. In an interger array named MSG_Read_Request, define the number of attributes to read and list the specific attribute numbers.



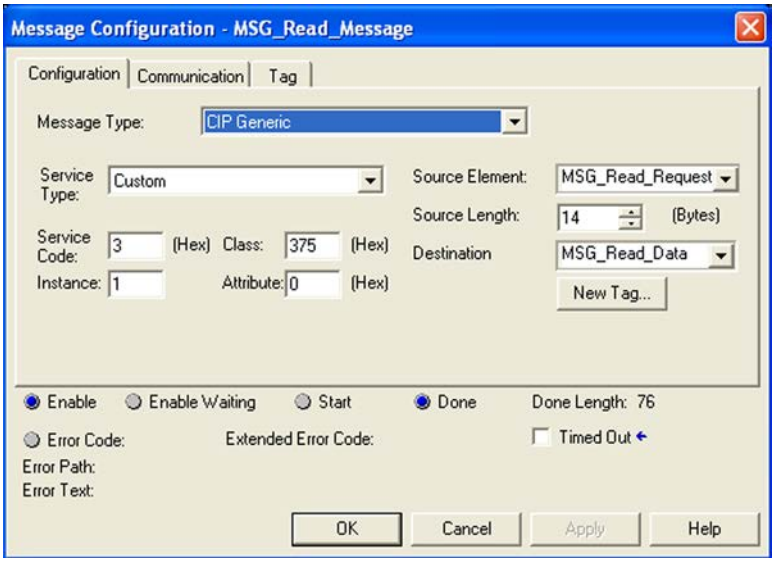
   The MSG instruction will return in an integer array with the first integer representing the following information:

   - number of attributes
   - first attribute number being returned
   - first attribute number data status
   - first attribute data...
   - last attribute number being returned
   - last attribute number data status
   - last attribute data

In the screen capture below, the user-defined structure listing the integers is being returned in this example.

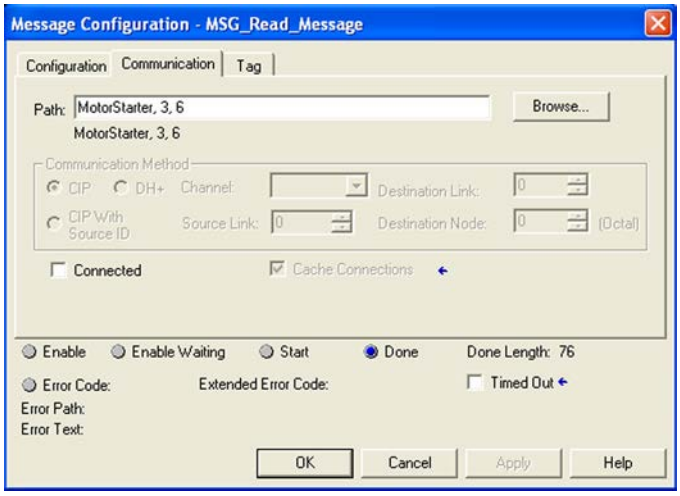
Number_of_Attributes	INT	Decimal
Voltage_Attribute_Num	INT	Decimal
Voltage_Attirbute_Status	INT	Decimal
Voltage_L1	INT	Decimal
Voltage_L2	INT	Decimal
Voltage_L3	INT	Decimal
Voltage_Average	INT	Decimal
Current_Attribute_Num	INT	Decimal
Current_Attribute_Status	INT	Decimal
Current_L1	INT	Decimal
Current_L2	INT	Decimal
Current_L3	INT	Decimal
Current_Average	INT	Decimal
Current_Ground_Fault	INT	Decimal
kW_Attribute_Num	INT	Decimal
kW_Attribute_Status	INT	Decimal
kW_L1	INT	Decimal
kW_L2	INT	Decimal
kW_L3	INT	Decimal
kW_Total	INT	Decimal
kVAR_Attribute_Num	INT	Decimal
kVAR_Attribute_Status	INT	Decimal
kVAR_L1	INT	Decimal
kVAR_L2	INT	Decimal
kVAR_L3	INT	Decimal
kVAR_Total	INT	Decimal
kVA_Attribute_Num	INT	Decimal
kVA_Attribute_Status	INT	Decimal
kVA_L1	INT	Decimal
kVA_L2	INT	Decimal
kVA_L3	INT	Decimal
kVA_Total	INT	Decimal
PF_Attribute_Num	INT	Decimal
PF_Attribute_Status	INT	Decimal
PF_L1	INT	Decimal
PF_L2	INT	Decimal
PF_L3	INT	Decimal
PF_Total	INT	Decimal

2. Set up the MSG instruction in the Configuration tab to read the list of attributes (Parameters Group) by configuring the following fields:
   - Message Type: CIP Generic
   - Service Type: Custom
   - Service Code: 0x03 (hex)
   - Class: 0x375 (hex)
   - Instance: 1 (dec)
   - Attribute: 0x00 (hex)
   - Source Element: MSG_Read_Request [0]
   - Source Length: 14 (bytes)
   - Destination: MSG_Read_Data



3. Set up the communications path in the Communications tab to read the data from the E3 Plus Overload Relay located at Node 6 by configuring the communication path as "MotorStarter, 3, 6".

NOTE: Motor Starter — the name of the EtherNet/IP Communications Auxiliary
3 — the port number of the DeviceNet Scanner of the EtherNet/IP Communications Auxiliary.
6 — the node address of the E3 Plus Overload Relay.



4. Click OK. When finished, the MSG instruction will read the 25 parameters from the E3 Overload Relay and place the results into MSG_Read_Data as shown below.

Scope: CompactLogix_L Show... Show All

Name	Value	Force Mask	Style	Data Type
+ Local:1:I	{...}	{...}		AB:1769_SDN_496Bytes:I:0
+ Local:1:O	{...}	{...}		AB:1769_SDN_364Bytes:O:0
− MSG_Read_Data	{...}	{...}		STATUS_OBJECT_READ_DATA
+ MSG_Read_Data.Number_of_Attributes	6		Decimal	INT
+ MSG_Read_Data.Voltage_Attribute_Num	15		Decimal	INT
+ MSG_Read_Data.Voltage_Attribute_Status	0		Decimal	INT
+ MSG_Read_Data.Voltage_L1	120		Decimal	INT
+ MSG_Read_Data.Voltage_L2	0		Decimal	INT
+ MSG_Read_Data.Voltage_L3	0		Decimal	INT
+ MSG_Read_Data.Voltage_Average	60		Decimal	INT
+ MSG_Read_Data.Current_Attribute_Num	1		Decimal	INT
+ MSG_Read_Data.Current_Attribute_Status	0		Decimal	INT
+ MSG_Read_Data.Current_L1	46		Decimal	INT
+ MSG_Read_Data.Current_L2	0		Decimal	INT
+ MSG_Read_Data.Current_L3	0		Decimal	INT
+ MSG_Read_Data.Current_Average	23		Decimal	INT
+ MSG_Read_Data.Current_Ground_Fault	0		Decimal	INT
+ MSG_Read_Data.kW_Attribute_Num	17		Decimal	INT
+ MSG_Read_Data.kW_Attribute_Status	0		Decimal	INT
+ MSG_Read_Data.kW_L1	51		Decimal	INT
+ MSG_Read_Data.kW_L2	0		Decimal	INT
+ MSG_Read_Data.kW_L3	0		Decimal	INT
+ MSG_Read_Data.kW_Total	51		Decimal	INT
+ MSG_Read_Data.kVAR_Attribute_Num	18		Decimal	INT
+ MSG_Read_Data.kVAR_Attribute_Status	0		Decimal	INT
+ MSG_Read_Data.kVAR_L1	-5		Decimal	INT
+ MSG_Read_Data.kVAR_L2	0		Decimal	INT
+ MSG_Read_Data.kVAR_L3	0		Decimal	INT
+ MSG_Read_Data.kVAR_Total	-5		Decimal	INT
+ MSG_Read_Data.kVA_Attribute_Num	19		Decimal	INT
+ MSG_Read_Data.kVA_Attribute_Status	0		Decimal	INT
+ MSG_Read_Data.kVA_L1	51		Decimal	INT
+ MSG_Read_Data.kVA_L2	0		Decimal	INT
+ MSG_Read_Data.kVA_L3	0		Decimal	INT
+ MSG_Read_Data.kVA_Total	51		Decimal	INT
+ MSG_Read_Data.PF_Attribute_Num	20		Decimal	INT
+ MSG_Read_Data.PF_Attribute_Status	0		Decimal	INT
+ MSG_Read_Data.PF_L1	99		Decimal	INT
+ MSG_Read_Data.PF_L2	100		Decimal	INT
+ MSG_Read_Data.PF_L3	0		Decimal	INT
+ MSG_Read_Data.PF_Total	100		Decimal	INT

E-mail/Text

Introduction

This chapter describes e-mail notifications and how to configure an EtherNet/IP Communications Auxiliary to send e-mail messages and text notifications for different communication events.

E-mail Notifications

Events

Several communication events can trigger e-mail notifications. These events are fault conditions for the DeviceNet scan list and EtherNet/IP Communications Auxiliary.

Fault Conditions for the DeviceNet Scan List			
Minor Recoverable	Major Unrecoverable	Wrong Data Size	Slave Init Error
Minor Unrecoverable	Connection Timeout	No Such Device	I/O Data Overflow
Major Recoverable	Keying Mismatch	Frag/Idle Error	Automatic Device Replacement Error
Acknowledge Timeout			
Fault Conditions for the EtherNet/IP Communications Auxiliary			
On Line	Global ADR Error	In Idle Mode	Duplicate Mac Error
Illegal Scan List Data	No Scanner Messages	Hardware Error	Data Link Error
No Network Messages	Transmit Failure	Bus Off Error	Non Volatile Storage Error

E-mail Contents

The subject and body contents in the e-mail message wil be created from the:

- type of trip or warning that is detected,
- device name,
- device description,
- device location, and
- contact information.

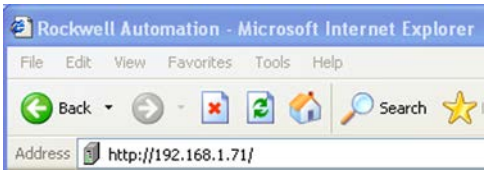
EXAMPLE	**E-mail Subject:**
	193-DNENCATR Comms Aux has detected a fault
	E-mail Body:
	Fault Status:
	Device Name: 193-DNENCATR Comms Aux
	Device Description: Motor Starters
	Device Location: Bay 6-U29
	Contact Info: Contact Person contactperson@thecontact.com

The first word in the e-mail subject is the device name. If a device name is not configured, then the product name attribute from the identity object will be used.

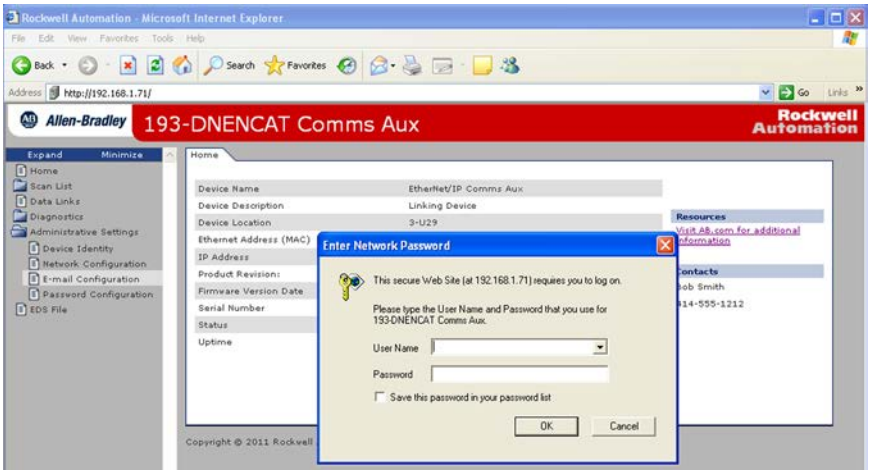
E-mail Configuration

To be able to send an e-mail, the IP address ot the hostname of a Simple Mail Transfer Protocol (SMTP) server must be configured and notifications must be selected. Follow these steps to configure an e-mail notification.

1. In the web browser, type the IP address of the EtherNet/IP Communications Auxiliary in the address bar, then press the enter key on the keyboard.



2. Select Administrative Settings E-Mail Configuration. A login window will appear.


Rockwell Automation - Microsoft Internet Explorer
Allen-Bradley
193-DNENCAT Comms Aux
Rockwell Automation
Enter Network Password
This secure Web Site (at 192.168.1.71) requires you to log on.
Please type the User Name and Password that you use for 193-DNENCAT Comms Aux.
User Name
Password
Save this password in your password list
OK
Cancel

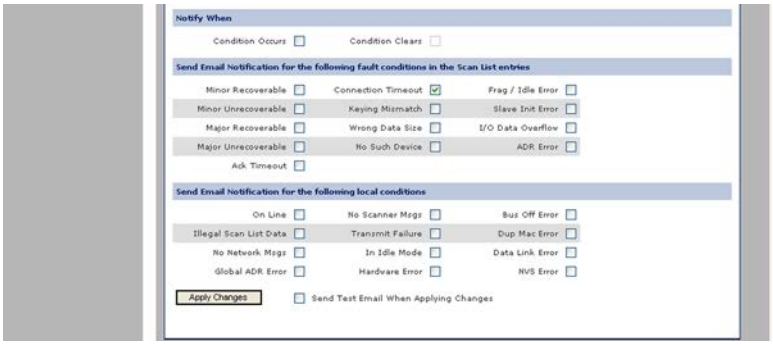
3. Log in with the username “Adminstrator”, leave the password field blank, and click OK.

NOTE: If desired, a password can be set within the Administrative Settings tab.

4. Type the information into the e-mail notification fields as stated below.

E-mail Recipient	The e-mail address of the person who will receive the notifications.
E-Mail Sender	The e-mail address from which the notification will be sent.
SMTP Server	Consult with the network administrator for the SMTP server address.
SMTP Username	Consult with the network administrator for the SMTP username.
SMTP Password	Consult with the network administrator for the SMTP password.
SMTP Port	Consult with the network administrator which SMTP port number to use. Port 25 is the most common SMTP port.

5. Check the desired notification time, fault conditions, and local conditions to be included in notification e-mails to the recipient. These can be changed after the initial configurations.



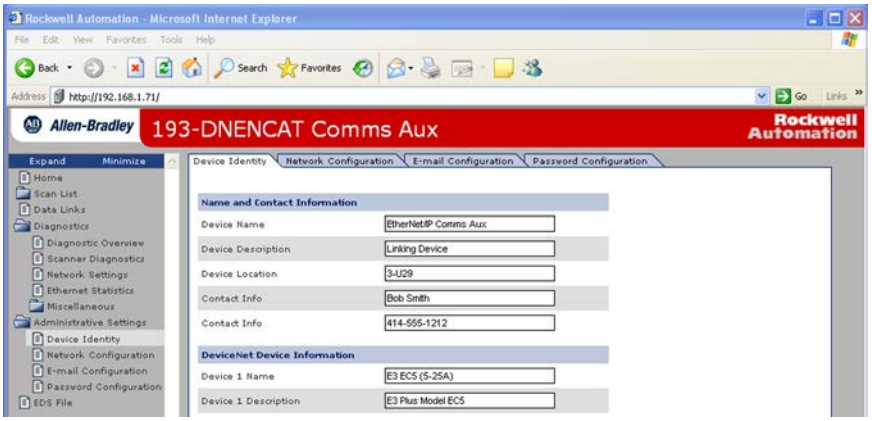
6. ClickApply Changes to save the configuration.

Configure Device Identity

The properties of the Device Identity populate the notification e-mail subject and e-mail body. To configure the Device Identity, perform the following steps.

1. Select Administrative Settings>Device Identity.

2. Type the Device Identity information into the fields as described below.



Device Name	The name of the EtherNet/IP Communications Auxiliary.
Device Description	The description of the EtherNet/IP Communications Auxiliary.
Device Location	The location of the EtherNet/IP Communications Auxiliary.
Contact Information	The contact information for the EtherNet/IP Communications Auxiliary.
Device X Name	The name of the DeviceNet device being scanned.
Device X Description	The description of the DeviceNet device being scanned.

3. Click Apply Changes to save the configuration.

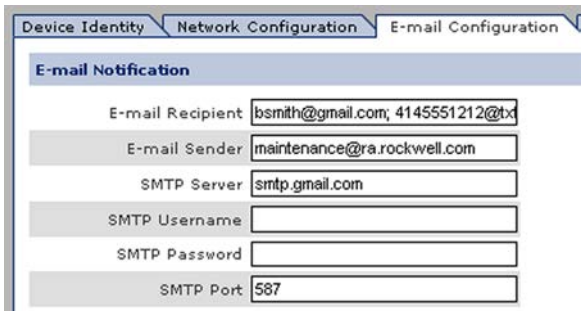
Text Notifications

The EtherNet/IP Communications Auxiliary can send a text message to a wireless phone be e-mailing the wireless phone's service provider. The format for the text message is provided by the service provider and looks similar to the example formats below.

AT&T™	10-digit wireless phone number@txt.att.net
Sprint®	10-digit wireless phone number@messaging.sprint.pcs.com

Multiple e-mail addresses can be entered into the E-mail Recipient field, separating each e-mail address with a semicolon (;). The E-mail Recipient field is limited to 255 characters.

EXAMPLE An EtherNet/IP Communications Auxiliary sending an e-mail and text message when a Communications Timeout event occurs:



Limitations

Based on the functionality of the EtherNet/IP Communications Auxiliary, there are some limitations on when the e-mails can be triggered.

- If two events occur at the same time, an e-mail will only be sent for the most significant error.
- If the device has been configured to send an e-mail for a lower prioritized event **and** this event occurs at the same time as a higher prioritized event for which the device has not been programmed to send an e-mail, an e-mail will not be sent for either event.
- The Clear e-mail will only be sent when all events have been cleared **and** an event e-mail has previously been sent.

Device Parameters

Introduction

The EtherNet/IP Communications Auxiliary provides parameters to allow the user to view the status and configure the DeviceNet scanner with RSNetWorx for DeviceNet if the user does not want to use the internal web server of the EtherNet/IP Communications Auxiliary. The 14 available parameters are listed below.

Table 8 - Parameter List

1	Scanner Status	**8**	SL Entry Size
2	SL Entry 1 Status	**9**	Device Keys
3	SL Entry 2 Status	**10**	Scanlist Config
4	SL Entry 3 Status	**11**	ADR Record
5	SL Entry 4 Status	**12**	ADR Enable
6	SL Entry 5 Status	**13**	DNet IO RPI
7	SL Entry 6 Status	**14**	DNet IO Inhibit

Parameter Programming

IMPORTANT Parameter setting changes to the EtherNet/IP Communications Auxiliary take effect immediately even during a "running" status.

Parameter Listing

The details for each of the 14 available parameters are listed below.

Table 9 - Parameter 1 — Scanner Status

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Provides the status of the Devicenet scanner.	Get	WORD	—	0	16383	0

Bit

0	On Line	**3**	No Scanner Messages	**6**	Initializing
1	Illegal Scan List	**4**	Transmit Failure	**7**	Duplicate MAC Failure
2	No Network Messages	**5**	In Idle Mode	**8**	Bus Off

Table 10 - Parameter 2 — SL Entry 1 Status

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Provides the status of the first scan list entry in the DeviceNet scanner.	Get	WORD	—	0	2047	0

Bit

0	On Line	**4**	No Such Device	**8**	Device Went Idle
1	Connection Timeout	**5**	Fragment Error	**9**	Automatic Device Replacement Error
2	Keying Mismatch	**6**	Slave Initialization Error		
3	Wrong Data Size	**7**	I/O Data Overflow	**10**	Acknoledgement Timeout

Table 11 - Parameter 3 — SL Entry 2 Status

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Provides the status of the second scan list entry in the DeviceNet scanner.	Get	WORD	—	0	2047	0

Bit

0	On Line	**4**	No Such Device	**8**	Device Went Idle
1	Connection Timeout	**5**	Fragment Error	**9**	Automatic Device Replacement Error
2	Keying Mismatch	**6**	Slave Initialization Error		
3	Wrong Data Size	**7**	I/O Data Overflow	**10**	Acknoledgement Timeout

Table 12 - Parameter 4 — SL Entry 3 Status

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Provides the status of the third scan list entry in the DeviceNet scanner.	Get	WORD	—	0	2047	0

Bit

0	On Line	**4**	No Such Device	**8**	Device Went Idle
1	Connection Timeout	**5**	Fragment Error	**9**	Automatic Device Replacement Error
2	Keying Mismatch	**6**	Slave Initialization Error		
3	Wrong Data Size	**7**	I/O Data Overflow	**10**	Acknoledgement Timeout

Table 13 - Parameter 5 — SL Entry 4 Status

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Provides the status of the fourth scan list entry in the DeviceNet scanner.	Get	WORD	—	0	2047	0

Bit

0	On Line	**4**	No Such Device	**8**	Device Went Idle
1	Connection Timeout	**5**	Fragment Error	**9**	Automatic Device Replacement Error
2	Keying Mismatch	**6**	Slave Initialization Error		
3	Wrong Data Size	**7**	I/O Data Overflow	**10**	Acknoledgement Timeout

Table 14 - Parameter 6 — SL Entry 5 Status

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Provides the status of the fifth scan list entry in the DeviceNet scanner.	Get	WORD	—	0	2047	0

Bit

0	On Line	**4**	No Such Device	**8**	Device Went Idle
1	Connection Timeout	**5**	Fragment Error	**9**	Automatic Device Replacement Error
2	Keying Mismatch	**6**	Slave Initialization Error		
3	Wrong Data Size	**7**	I/O Data Overflow	**10**	Acknoledgement Timeout

Table 15 - Parameter 7 — SL Entry 6 Status

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Provides the status of the sixth scan list entry in the DeviceNet scanner.	Get	WORD	—	0	2047	0

Bit

0	On Line	**4**	No Such Device	**8**	Device Went Idle
1	Connection Timeout	**5**	Fragment Error	**9**	Automatic Device Replacement Error
2	Keying Mismatch	**6**	Slave Initialization Error		
3	Wrong Data Size	**7**	I/O Data Overflow	**10**	Acknoledgement Timeout

Table 16 - Parameter 8 — SL Entry Size

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Defines the number of bytes to be scanned for I/O data from each DeviceNet Device.	Get/Set	USIN T	Bytes	1	50	8

Table 17 - Parameter 9 — Device Keys

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Determines how electronic keying will be performed.	Get/Set	USIN T	—	0	63	7

Bit

0	Device Type	**2**	Product Code	**4**	Minor Revision
1	Vendor	**3**	Major Revision	**5**	Minor of Higher

Table 18 - Parameter 10 — Scanlist Config

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Triggers the building of a new DeviceNet scan list. 0 = Ready 1 = Build Scan List	Get/Set	BOOL	—	0	1	0

Table 19 - Parameter 11 — ADR Record

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Triggers the recording of configuration parameters from devices in the DeviceNet scan list to be used for Automatic Device Replacement. 0 = Ready 1 = Record Parameters	Get/Set	BOOL	—	0	1	0

Table 20 - Parameter 12 — ADR Enable

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Enables Automatic Device Replacement. 0 = Disable 1 = Enable	Get/Set	BOOL	—	0	1	0

Table 21 - Parameter 13 — DNet IO RPI

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Defines the requested packet interval rate in milliseconds used on DeviceNet Polled I/O messaging.	Get/Set	WORD	ms	2	1000	75

Table 22 - Parameter 14 — DNet IO Inhibit

Description	Access Rule	Data Type	Units	Value		
				Min.	Max.	Default
Defines the inhibit time in milliseconds used on DeviceNet Change of State (COS) I/O messaging.	Get	WORD	ms	2	1000	1

Troubleshooting

Introduction

The purpose of this chapter is to assist in troubleshooting the EtherNet/IP Communications Auxiliary.

SHOCK HAZARD: Servicing energized industrial control equipment can be hazardous. Electrical shock, burns, or unintential actuation of controlled industrial equipment may cause death or serious injury .For safety of maintenance personnel as well as others who may be exposed to electrical hazards assicated with maintenance activities, follow local safety related work practices (e.g., the NFPS 70W; Part II, *Electrical Safety for Employee Workplaces*, in the United States) when working on or near energized equipment. Maintenance personnel must be trained in the safety practices, procedures, and requirements that pertain to their respective job assignments. Do not work alone on energized equipment.

ATTENTION: Do not attempt to defeat or override fault circuits. The cause of a fault indication must be determined and corrected before attempting operation. Failure to correct a control system or mechanical malfunction may result in personal injury and/or equipment damage due to uncontrolled machine system operation.

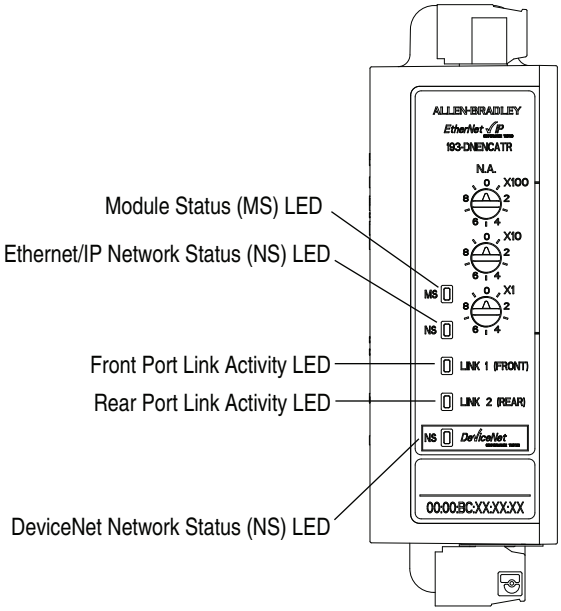
EtherNet/IP Modules of Operation

The EtherNet/IP Communications Auxiliary has four EtherNet/IP modes of operation:

- Power-Up Reset Mode,
- Run Mode,
- Recoverable Error Mode, and
- Unrecoverable Error Mode.

Power-Up Reset Mode

Figure 8 - Status LEDs



During the Power-Up Reset Mode, the following procedure occurs.

1. The various LEDs will cycle simultaneously.
   - Module Status (MS) LED will flash green for approximately 0.25 seconds, flash red for another 0.25 seconds, then remain a solid green.
   - EtherNet/IP Network Status (NS) LED will flash green for approximately 0.25 seconds, flash red for another 0.25 seconds, then not illuminate.
   - Device Network Status (NS) LED will flash green for approximately .25 seconds, flash red for another0 .25 seconds, then not illuminate.

   The MS and both NS LEDs will then return to their standard illuminated state.
2. The EtherNet/IP Communications Auxiliary will perform a duplicate IP address check to verify that another module is not assigned to the same IP address. If a duplicate IP address is detected on the network, the EtherNet/IP NS LED illuminates to a solid red, the MS LED flashes red, and the EtherNet/IP Communications Auxiliary enters the Recoverable Error Mode.
3. The EtherNet/IP Communications Auxiliary performs a duplicate MAC address check to verify that another module is not assigned to the same MAC address. If a duplicate MAC address is detected on the DeviceNet network, the DeviceNet NS LED illuminates a solid red, the MS LED flashes red, and the EtherNet/IP Communications Auxiliary enters the Recoverable Error Mode.

4. If the power-up or reset is successful, the overload relay will enter into Run Mode.

Run Mode

In Run Mode, the EtherNet/IP Communications Auxiliary will:

- operate as a slave device to a master device on an EtherNet/IP network.
- operate as a master device and scan up to six slave devices on a DeviceNet network.
- accept messages from a master on the EtherNet/IP network.
- send response messages, COS messages, or CYCLIC messages to a master.
- support a Device Level Ring (DLR) for Caralog Number 193-DNENCATR.

If a communication error is detected, the EtherNet/IP Communications Auxiliary will either enter the Recoverable Error Mode or Unrecoverable Error Mode.

Operating as a Slave Device to a Master Device

As stated, the EtherNet/IP Communications Auxiliary will operate as a slave device to a master device on an EtherNet/IP network in Run Mode. The EtherNet/IP NS LED will flash green if there are no network connections established with an EtherNet/IP network master. When one or more connections are in the “established’ state, the EtherNet/IP NS LED will illuminate a solid green. When one or more connections are in the “timed out” state, the EtherNet/IP NS will flash red.

Operating as a Master Device

As also stated, the EtherNet/IP Communications Auxiliary will also operate as a master device and scan up to six slave devices on a DeviceNet network in Run Mode. The DeviceNet NS LED will flash green if there are no connections established with a DeviceNet slave device. When one or more connections are in the “established” state, the DeviceNet NS LED will illumiate a solid green. When one or more connections are in the “timed out” state, the DeviceNet NS LED will flash red. If no slave devices are defined in the DeviceNet scan list, the MS LED will flash red.

Recoverable Error Mode

In this mode, the EtherNet/IP Communications Auxiliary MS LED flashes red. The device will respond to messages that are specified in offline mode recovery message protocol.

Error Type	Description	LED State
Recoverable	Duplicate IP address detected.	Flashing Red
	A device is not present on the DeviceNet scan list.	

Unrecoverable Error Mode

In this mode, the EtherNet/IP Communications Auxiliary MS LED illuminates a solid red. The device continues in this state as long as the device is powered.

Error Type	Description	LED State
Unecoverable	Power-up initialization failure.	Solid Red
	Data communication error.	

Troubleshooting Procedures

The following table identifies possible causes and corrective actions when troubleshooting EtherNet/IP related failures using the status LEDs.

Table 23 - Troubleshooting Procedures

Status LED	Color	State	Possible Cause	Corrective Action
EtherNet/IP Network Status (NS)	None	—	The EtherNet/IP Communications Auxiliary is not receiving power.	Check the DeviceNet cable connections and verify that 24V DC exists between the red and black terminals.
	Green, Red, Not Illuminated	Flashing (once)	Normal	This is a normal power-up sequence.
	Green	Flashing	The EtherNet/IP Communications Auxiliary is online, but with no connections established.	Check the EtherNet/IP master and its scan list for correct scanner configuraton.
	Green	Solid	Normal operating state and the EtherNet/IP Communications Auxiliary is allocated to a master.	No action is required.
	Red	Flashing	One or more EtherNet/IP connections timed out.	Reset the EtherNet/IP master device.
	Red	Solid	Diagnostics test failed on power-up/reset. An internal fault exists.	Cycle power to the unit. If the fault still exists, replace the unit.
			Duplicate EtherNet/IP module address exists. Two modules cannot have the same address.	Change the IP address to a valid setting and reset the device.
			A fatal communication error occurred.	Check Ethernet media for proper installation.

Status LED	Color	State	Possible Cause	Corrective Action
DeviceNet Network Status (NS)	None	—	The EtherNet/IP Communications Auxiliary is not receiving power.	Check the DeviceNet cable connections and verify that 24V DC exists between the red and black terminals.
	Green, Red, Not Illuminated	Flashing (once)	Normal	This is a normal power-up sequence.
	Green	Flashing	The EtherNet/IP Communications Auxiliary is not configured to scan any DeviceNet slave devices.	Check the DeviceNet scan list for the correct scanner configuration.
	Green	Solid	Normal operating state and the EtherNet/IP Communications Auxiliary is scanning DeviceNet slave devices.	No action is required.
	Red	Flashing	One or more DeviceNet connections timed out.	Reset the EtherNet/IP Communications Auxiliary.
	Red	Solid	Diagnostics test failed on power-up/reset. An internal fault exists.	Cycle power to the unit. If the fault still exists, replace the unit.
			Duplicate DeviceNet module address exists. Two modules cannot have the same address.	Change the MAC address to a valid setting and reset the device.
			A fatal communication error occurred.	Check DeviceNet media for proper installation.
Module Status	None	—	The EtherNet/IP Communications Auxiliary is not receiving power.	Check the DeviceNet cable connections and verify that 24V DC exists between the red and black terminals.
	Green, Red, Not Illuminated	Flashing (once)	Normal	This is a normal power-up sequence.
	Green	Flashing	The EtherNet/IP Communications Auxiliary is proper;y scanning DeviceNet slave devices, but it is not being scanned by the EtherNet/IP master.	Check the Ethernet scan list for the correct scanner configuration.
	Green	Solid	Normal operating state, the EtherNet/IP Communications Auxiliary is scanning DeviceNet slave devices, and is allocated to its master.	No action is required.
	Red	Flashing	One or more DeviceNet or EtherNet/IP connections timed out.	Reset the EtherNet/IP Communications Auxiliary.
			The EtherNet/IP Communications Auxiliary is not configured to scan any DeviceNet slave devices.	Check the DeviceNet scan list for correct scanner configuration.
	Red	Solid	Diagnostics test failed on power-up/reset.	Cycle power to the device. If the fault still exists, replace the device.
Link Link (front) Link (back)	None	—	The EtherNet/IP Communications Auxiliary is not properly connected to an Ethernet network.	Check the Ethernet cabling to make sure it is properly installed.
	Green	Flashing	The Ethernet network is properly connected.	No action is required.
	Green	Solid	Communications are occurring on the Ethernet network.	No action is required.

Specifications

Specifications

Table 24 - Ratings

Terminal Ratings		
Terminal Screw		M3
Wire Cross Section		See wiring diagram section
Torque		0.56…0.79 N•m (5…7 lb.•in.)
Degree of Protection		IP20
Power Supply Ratings		
Rated Supply Voltage	U_s	24V DC
Rated Operating Range	U_e	24V -15%, +10% DC
Rated Supply Current	I_e	100 mA at 24V DC
Maximum Surge Current at Power-Up		6.4 A
Maximum Power Consumption		2.1 W
Environmental Ratings		
Ambient Temperature Storage Operating (Open) (Enclosed)	T_{amb}	 -40…+85 °C (-40…+185 °F) -20…+60 °C (-4…+140 °F) -20…+40 °C (-4…+104 °F)
Humidity Operating Damp Heat - Steady State Damp Heat - Cyclic		 5…95% non-condensing per IEC 68-2-3 per IEC 68-2-30
Cooling Method		Natural Convection
Vibration (per IEC 68-2-6)		3 G
Shock (per IEC 68-2-27)		30 G
Maximum Altitude		2000 m
Pollution Environment		Pollution Degree 2
Terminal Marking		EN 50012
Degree of Protection		IP20

Table 25 - Electromagnetic Compatibility

Electromagnetic Compatibility	
Electrostatic Discharge Immunity Test Level Performance Criteria	 8 kV Air Discharge 4 kV Contact Discharge B❶❷
RF Immunity Test Level Performance Criteria	 10V/m: 80 MHz…1 GHz 3V/m: 1.4 GHz…2 GHz 1V/m: 2.0 GHz…2.7 GHz B❶❷
Electrical Fast Transient/Burst Immunity Test Level Performance Criteria	 2 kV (Power Protective Earth) 1 kV (control bus cable) B❶❷
Surge Immunity Test Level Performance Criteria	 1 kV L-L (bus cable) B❶❷
Radiated Emissions	Class A
Conducted Emissions	Class A

❶ Performance Criteria B requires the DUT (device under test) not to experience degradation or loss of performance.

❷ Environment 2 - Heavy Industrial.

WARNING: This is a class A product. In domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

Table 26 - Ethernet IP Communcations

EtherNet/IP Communications	
Total Connections Supported TCP CIP	 150 47
Total CIP Unconnected Messages Supported	128
CIP Class 1 Connection Consumed	1
Packet Rates (packets/second) I/O HIM/MSG	 500 500
Media Support Twisted Pair Fiber	 Yes No
Speed Duplex (Half/Full)	10/100
Duplicate IP Detection	Yes

Table 27 - Standards & Certifications

Standards and Certifications
UL 508
CSA 22.2, No. 14
EN 60947-4-1

EtherNet/IP & DeviceNet Information

Electronic Data Sheet (EDS) Files

EDS files are specially formatted ASCII files that provide all of the information necessary for a configuration tool (e.g., RSNetWorx for EtherNet/IP) to access and alter the parameters of a device. The EDS file contains all the parameter information of a device: number of parameters, groupings, parameter name, min, max, and default values, units, data format and scaling. The EDS file for the EtherNet/IP Communications Auxiliary is available from the Internet at www.ab.com/networks/eds/index.html. It can also be obtained from the EtherNet/IP Communications Auxiliary's internal web page.

Common Industrial Protocol (CIP) Objects

The following CIP object classes are supported.

Table 28 - CIP Object Classes

Class	Object	EtherNet/IP	DeviceNet
0x01	Identity	X	X
0x02	Message Router	X	X
0x03	DeviceNet		X
0x04	Assembly	X	X
0x05	Connection		X
0x06	Connection Manager	X	
0x0F	Parameter	X	X
0x47	Device Level Ring Object	X	
0x48	Q05 Object	X	
0xA1	Non-Volatile Storage Object	X	X
0xF4	Port Object	X	X
0xF5	TCP/IP Interface	X	
0xF6	Ethernet Link	X	

Identity Object — CLASS CODE 0x01

The following class attributes are supported for the Identity Object.

Table 29 - Identity Object Class Attributes

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	0x0001
2	Get	Max. Instance	UINT	0x00011

Identity Object instances contain the following instance attributes.

Table 30 - Identity Object Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Vendor ID	UINT	
2	Get	Device Type	UINT	12
3	Get	Product Code	UINT	220 for 193-DNENCAT 221 for 193-DNENCATR
4	Get	Major Revision	USINT	1
		Minor Revision	USINT	1
5	Get	Status	WORD	Bit 0: Owned, shall be set when at least one connection i configured Bit 2: Configured Bit 8: Minor Recoverable fault Blt 9: Minor Unrecoverable fault Bit 10: Major Recoverable fault Bit 11: Major Unrecoverable fault
6	Get	Serial Number	UDINT	Unique number assigned for each device
7	Get	Product Name	SHORT_STRING	Product name
8	Get	State	USINT	3=Operational

The following common services are implemented for the Identity Object.

Table 31 - Identity Object Common Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x01	No	Yes	Get Attribute All
0x0E	Yes	Yes	Get Attribute Single
0x05	No	Yes	Reset

Message Router Object — CLASS CODE 0x02

No class or instance attributes are supported. The message router object exists only to route explicit messages to other objects.

DeviceNet Object — CLASS CODE 0x03

The following class attributes will be supported for the DeviceNet Object.

Table 32 - DeviceNet Object Class Attributes

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	2

A single instance of the DeviceNet Object will be supported by the following attributes.

Table 33 - Single Instance of the DeviceNet Object

Attribute ID	Access Rule	Name	Data Type	Value
1	Get/Set	Node Address	USINT	0-63
2	Get/Set	Baud Rate	USINT	0=125K 1=250K 2=500K
13	Get	Active Node Table	Array of BOOL [64]	Identifies which nodes are online on the local network based on the node address.

The following services will be implemented for the DeviceNet Object.

Table 34 - DeviceNet Object Common Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x0E	Yes	Yes	Get Attribute Single
0x10	No	Yes	Set Attribute Single

Assembly Object — CLASS CODE 0x04

The following class attributes are supported for the Assembly Object.

Table 35 - Assembly Object Class Attributes

Attribute ID	Access Rule	Name	Data Type	Value
2	Get	Max. Instance	UINT	120

Instance Attributes

Instances/Connection points implements the following data attributes.

Table 36 - Instance Attributes

#	Access	Name	Type	Value	Description
3	Get/Set	Data	Array of UINT	—	Data produced/consumed by the module

Output Assemblies

The following output assembly instances are implemented.

Table 37 - Instance 100

Byte Size	Contents
Scan List I/O Size	Data to be delivered to the first scan list entry.
Scan List I/O Size	Data to be delivered to the second scan list entry.
Scan List I/O Size	Data to be delivered to the third scan list entry.
Scan List I/O Size	Data to be delivered to the fourth scan list entry.
Scan List I/O Size	Data to be delivered to the fifth scan list entry.
Scan List I/O Size	Data to be delivered to the sixth scan list entry.

Input Assemblies

Table 38 - Instance 101

Byte Size	Contents
4 Bytes	Logix Status Word
2 Bytes	DeviceNet Scanner Status (Parameter 1) See Table 9 on page 73
2 Bytes	Scan List Entry 1 Status Word (Parameter 2) See Table 10 on page 74
2 Bytes	Scan List Entry 2 Status Word (Parameter 3) See Table 11 on page 74
2 Bytes	Scan List Entry 3 Status Word (Parameter 4) See Table 12 on page 74
2 Bytes	Scan List Entry 4 Status Word (Parameter 5) See Table 13 on page 75
2 Bytes	Scan List Entry 5 Status Word (Parameter 6) See Table 14 on page 75
2 Bytes	Scan List Entry 6 Status Word (Parameter 7) See Table 15 on page 75
Scan List I/O Size	Data to be delivered to the first scan list entry.
Scan List I/O Size	Data to be delivered to the second scan list entry.
Scan List I/O Size	Data to be delivered to the third scan list entry.
Scan List I/O Size	Data to be delivered to the fourth scan list entry.
Scan List I/O Size	Data to be delivered to the fifth scan list entry.
Scan List I/O Size	Data to be delivered to the sixth scan list entry.
2 Bytes	DataLink 1 Data
2 Bytes	DataLink 2 Data
2 Bytes : : : :	DataLink 3 Data : : : :
2 Bytes	Data Link 48 Data

Table 39 - Instance 103 ❶

Byte Size	Contents
4 Bytes	Logix Status Word
4 Bytes	DeviceNet Scanner Status (Parameter 1) See Table 9 on page 73
4 Bytes	Scan List Entry 1 Status Word (Parameter 2) See Table 10 on page 74
4 Bytes	Scan List Entry 2 Status Word (Parameter 3) See Table 11 on page 74
4 Bytes	Scan List Entry 3 Status Word (Parameter 4) See Table 12 on page 74
4 Bytes	Scan List Entry 4 Status Word (Parameter 5) See Table 13 on page 75
4 Bytes	Scan List Entry 5 Status Word (Parameter 6) See Table 14 on page 75
4 Bytes	Scan List Entry 6 Status Word (Parameter 7) See Table 15 on page 75
Scan List I/O Size	Data to be delivered to the first scan list entry.
Scan List I/O Size	Data to be delivered to the second scan list entry.
Scan List I/O Size	Data to be delivered to the third scan list entry.
Scan List I/O Size	Data to be delivered to the fourth scan list entry.
Scan List I/O Size	Data to be delivered to the fifth scan list entry.
Scan List I/O Size	Data to be delivered to the sixth scan list entry.
2 Bytes	DataLink 1 Data
2 Bytes	DataLink 2 Data
2 Bytes	DataLink 3 Data
: : : :	: : : :
2 Bytes	Data Link 48 Data

❶ Available with firmware v 2.00 and higher.

Configuration Assembly

Table 40 - Instance 102 (Revision 1)

Byte Size	Contents
2 Bytes	Revision = 1
2 Bytes	ScanList I/O Size
2 Bytes	Data Link Update Interval (ms)
1 Byte	Data Link 1 Node
2 Bytes	Data Link 1 Parameter
1 Byte	Data Link 2 Node
2 Bytes	Data Link 2 Parameter
1 Byte	Data Link 3 Node
2 Bytes	Data Link 3 Parameter
1 Byte	Data Link 4 Node
2 Bytes	Data Link 4 Parameter
1 Byte	Data Link 5 Node
2 Bytes	Data Link 5 Parameter
1 Byte	Data Link 6 Node
2 Bytes	Data Link 6 Parameter
: : : :	: : : :
1 Byte	Data Link 48 Node
2 Bytes	Data Link 48 Parameter

Table 41 - Instance 102 (Revision 2)❶

Byte Size	Contents
2 Bytes	Revision = 2
2 Bytes	ScanList I/O Size
2 Bytes	Data Link Update Interval (ms)
2 Bytes	Reserved
2 Bytes	Data Link 1 Node
2 Bytes	Data Link 1 Parameter
2 Bytes	Data Link 2 Node
2 Bytes	Data Link 2 Parameter
2 Bytes	Data Link 3 Node
2 Bytes	Data Link 3 Parameter
2 Bytes	Data Link 4 Node
2 Bytes	Data Link 4 Parameter
2 Bytes	Data Link 5 Node
2 Bytes	Data Link 5 Parameter
2 Bytes	Data Link 6 Node
2 Bytes	Data Link 6 Parameter
: : : :	: : : :
2 Bytes	Data Link 48 Node
2 Bytes	Data Link 48 Parameter

❶ Available with firmware v 2.00 and higher.

The following services are implemented for the Assembly Object.

Table 42 - Ethernet Object Common Services

	Implemented for:			
Service Code	Class	Instance Consuming	Instance Producing	Service Name
0x0E	Yes	Yes	Yes	Get Attribute Single
0x10	No	Yes	No	Set Attribute Single

Connection Manager Object — CLASS CODE 0x06

No class or instance attributes are supported.

The following common service are implemented for the Connection Manager Object.

Table 43 - Connection Manager Object Common Services

Implemented for:	
Instance	**Service Name**
Yes	Forward Open
Yes	Forward Close
Yes	Unconnected Send

Parameter Object — CLASS CODE 0x0F

The following class attributes are supported for the Parameter Object.

Table 44 - Parameter Object Class Attributes

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	0x0001
2	Get	Max Instance	UINT	0x0029
8	Get	Parameter Class Descriptor	WORD	0x000B

The following instance attributes are implemented for all parameter attributes.

Table 45 - Parameter Object Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Value
1	Get/Set	Value	Specified in Descriptor	N/A
2	Get	Link Path Size	USINT	
3	Get	Link Path	Packed EPATH:	Path to specified object attribute
4	Get	Descriptor	WORD	Parameter Dependent
5	Get	Data Type	EPATH	
6	Get	Data Size	USINT	
7	Get	Parameter Name String	SHORT_STRING	
8	Get	Units String	SHORT_STRING	
9	Get	Help String	SHORT_STRING	
10	Get	Minimum Value	Specified in Descriptor	
11	Get	Maximum Value	Specified in Descriptor	
12	Get	Default Value	Specified in Descriptor	
13	Get	Scaling Multiplier	UINT	
14	Get	Scaling Divisor	UINT	
15	Get	Scaling Base	UINT	
16	Get	Scaling Offset	INT	
17	Get	Multiplier Link	UINT	

Attribute ID	Access Rule	Name	Data Type	Value
18	Get	Divisor Link	UINT	
19	Get	Base Link	UINT	
20	Get	Offset Link	UINT	
21	Get	Decimal Precision	USINT	Parameter Dependent

The following commons services are implemented for the Parameter Object.

Table 46 - Parameter Object Common Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x01	No	Yes	Get Attribute All
0x0E	Yes	Yes	Get Attribute Single
0x10	No	Yes	Set Attribute Single
0x4B	No	Yes	Get Enum String

Device Level Ring (DLR) Object — CLASS CODE 0x47

No class attributes will be supported for the DLR object. A single instance (Instance 1) will be supported.

Table 47 - DLR Object Single Instance

Attributes ID	Access Rule	Name	Data Type	Value
1	Get	Network Topology	USINT	0=Linear 1=Ring
2	Get	Network Status	USINT	0=Normal 1=Ring Fault 2=Unexpected Loop Detect 3=Partial Network Fault 4=Rapid Fault/Restore Cycle
10	Get	Active Supervisor Address	Structure of UDINT; array of 6 USINT	Ring Supervisor
12	Get	Capability Flags	DWORD	0x00000002

The following common services will be implemented for the DLR object.

Table 48 - DLR Object Common Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x01	No	Yes	Get_Attributes_All
0x0E	No	Yes	Get_Attribute_Single

QoS Object — CLASS CODE 0x48

The following class attributes will be supported for the QoS object.

Table 49 - QoS Object Class Attributes

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1

A single instance (Instance 1) will be supported.

Table 50 - QoS Object Instance

Attribute ID	Access Rule	Name	Data Type	Value
1	Set	802: 1Q Tag Enable	USINT	0=Disable (default) 1=Enable
4	Set	DSCP Urgent	USINT	Default=55
5	Set	DSCP Schedule	USINT	Default=47
6	Set	DSCP High	USINT	Default=43
7	Set	DSCP Low	USINT	Default=31
8	Set	DSCP Explicit	USINT	Default=27

The following common services will be implemented for the QoS object.

Table 51 - QoS Object Common Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Non-Volatile Storage Object — CLASS CODE 0xA1

The following instances of the Non-Volatile Storage object will be supported.

Table 52 - Non-Volatile Storage Object Instances

NVS Object Instance	Entity to be Updated
1	EtherNet/IP Module Application Code
2	EtherNet/IP Module Boot Code
3	EtherNet/IP Module FPGA Image

Port Object — CLASS CODE 0x0F4

The Port object supports the following class attributes.

Table 53 - Port Object Class Attributes

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1
2	Get	Max. Instance	UINT	2
3	Get	Num. Instances	UINT	2
8	Get	Entry Port	UINT	1
9	Get	Port Instance Info	Array of Structure of	1
		Port Type	UINT	
		Port Number	UINT	

Two instances of the Port object will be supported. Instance 1 will represent the EtherNet/IP port and Instance 2 will represent the DeviceNet port.

Table 54 - Port Object Instances

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Port Type	UINT	Inst 1=4; Inst 2=5
2	Get	Port Number	UINT	
3	Get	Link Object	Struct of	
		Path Length	UINT	
		Link Path	Padded EPATH	
4	Get	Port Name	Short String	Inst 1="Port A"; Inst 2="Port B"
5	Get	Port Type Name	Short String	Inst 1="EtherNet/IP"; Inst 2="DeviceNet"
7	Get	Node Address	Padded EPATH	
8	Get	Port Node Range	Struct of	This attribute is implemented for Inst 2 only.
		Min. Node Number	UINT	
		Max. Node Number	UINT	

The following services will be implemented.

Table 55 - Port Object Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x01	Yes	Yes	Get_Attributes_All
0x0E	Yes	Yes	Get_Attribute_Single

TCP/IP Interface Object — CLASS CODE 0xF5

The TCP/IP object supports the following class.

Table 56 - TCP/IP Object Class

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	3

For single port devices, one instance of the TCP/IP interface object is supported. For dual port devices, two instances of the TCP/IP interface object are supported.

Table 57 - TCP/IP Object Class Instances

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Status	DWORD	
2	Get	Configuration Capability	DWORD	0x00000014
3	Get/Set	Configuration Control	DWORD	0=Configuration from NVS 2=Configuration from DHCP
4	Get	Physical Link Object	Struct of: UINT Padded EPATH	 For a single port device: 2 words 20 F6 24 01 (ENet Link Object Inst 1) For dual port device: NULL
5	Get/Set	Interface Configuration	Struct of: UDINT UDINT UDINT UDINT UDINT STRING	 IP Address Network Mask Gateway Address Primary DNS Secondary DNS Default domain name for not fully qualified host names
6	Get/Set	Host Name	STRING	
8	Get/Set	TTL Value	USINT	Time to live value for EtherNet/IP multicast packets
9	Get/Set	Multicast Config	Struct of: USINT USINT UINT UDINT	 Allocation Control Reserved Number of multicast addresses to allocate (1-4) Multicast starting address

The following common services are implemented for the TCP/IP interface object.

Table 58 - TCP/IP Interface Object Common Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x01	No	Yes	Get_Attributes_All
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Ethernet Link Object — CLASS CODE 0xF6

The following class attributes are supported for the Ethernet Link object.

Table 59 - Ethernet Link Object Class Attributes

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1

The following one instance of the Ethernet Link object is supported.

Table 60 - Ethernet Link Object Instance

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Interface Speed	UDINT	10 or 100 Mbit/sec
2	Get	Interface Flags	DWORD	See ENet/IP Spec
3	Get	Physical Address	ARRAY of 6 USINTs	MAC Address
4	Get	Interface Counters	Struct of: In Octets In Ucast Packets In NUcast Packets In Discards In Errors In Unknown Protos Out Octects Out Ucast Packets Out NUcast Packets Out Discards Out Errors	
5	Get	Media Encounters	Struct of: Alignment Errors FCS Errors Single Collisions SQE Test Errors Deferred Transmits Late Collisions Excessive Collisions MAC Transmit Errors Carrier Sense Errors Frame Too Long MAC Receive Errors	

Attribute ID	Access Rule	Name	Data Type	Value
6	Get/Set	Interface Control	Struct of: Control Bits Forced Interface Speed	
7	Get	Interface Type	USINT	
8	Get	Interface State	USINT	
10	Get	Interface Label	SHORT_STRING	Instance 1: Port 1 Instance 2: Port 2

The following common services are implemented for the Ethernet Link object.

Table 61 - Ethernet Link Object Common Services

Service Code	Implemented for:		Service Name
	Class	Instance	
	No	Yes	Get_Attributes_All
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products.
At http://www.rockwellautomation.com/support/, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/support/.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.

Rockwell Otomasyon Ticaret A.Ş., Kar Plaza İş Merkezi E Blok Kat:6 34752 İçerenköy, İstanbul, Tel: +90 (216) 5698400

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Rockwell Automation Publication 193-UM014B-EN-P December 2011
Supercedes Publication 193-UM014A-EN-P - July 2011
Copyright © 2011 Rockwell Automation, Inc. All rights reserved. Printed in the U.S.A.